

Original instructions



AVANTI SERVICE LIFT

User's, Installation and Maintenance Manual

Model Service Lift PEGASUS





CE certificate of Pegasus CE versions:

CERTIFICATE

EC Directive 2006/42/EC, Article 12, Paragraph 3b Machinery

Certificate Registration No.: 01/205/0823/14 B

Certification body for machinery NB 0035
of TÜV Rheinland Industrie Service GmbH
hereby certifies the company

AVANTI WIND SYSTEMS, S.L.

Pol. Ind. Centrovía – c/ Los Ángeles, nº88
E-50196 La Muela, Zaragoza
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Conformity of the product

Vertical Platform Service Lift Inside Wind Turbine Systems

Type: PEGASUS-250 kg

Modification: additional basket "tool kit"

Technical data:

Ident. No: 20LP0001
Type of drive: Electric / Pinion-Rack
Max. Lifting height: 150 m
Max. load capacity: 250 kg / 2 People
Max. Lifting speed: 0,33 m/s

with the requirements defined in Annex I to Directive 2006/42/EC on machinery and amending Directive 95/16/EC of the European Parliament and the Council in May 2006 on the approximation of laws, regulations and administrative Member States relating to machinery.

Proof has been furnished on the basis of an EC Type Examination, Report No.: AE.COL.00022-12 from 03.02.2014, and is valid subject to compliance with the requirements stated in this document.

This certificate is valid until 17.09.2018



Berlin, 28.02.2014

Certification body
Notified under No. 0035
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Genau. Richtig.



AECO certificate of Pegasus AECO version:

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1. Limited Warranty

Avanti Wind Systems A/S warrants that commencing from the date of shipment to the Customer and continuing for a period of the longer of 365 days thereafter, or the period set forth in the standard AVANTI warranty, the Product¹⁾ described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

This warranty is made only to the original user of the Product. The sole and exclusive remedy and the entire liability of Avanti under this limited warranty, shall be, at the option of Avanti, a replacement of the Product (including incidental and freight charges paid by the Customer) with a similar new or reconditioned Product of equivalent value, or a refund of the purchase price if the Product is returned to Avanti, freight and insurance prepaid. The obligations of Avanti are expressly conditioned upon return of the Product in strict accordance with the return procedures of Avanti.

This warranty does not apply if the Product (i) has been altered without the authorization of Avanti or its authorized representative; (ii) has not been installed, operated, repaired, or maintained in accordance with this Manual or other instructions from Avanti; (iii) has been subjected to abuse, neglect, casualty, or negligence; (iv) has been furnished by Avanti to Customer without charge; or (v) has been sold on an "AS-IS" basis.

Except as specifically set forth in this Limited Warranty,

ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SATISFACTORY QUALITY, COURSE OF DEALING, LAW, USAGE OR TRADE PRACTICE ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY AVANTI. IF, PURSUANT TO ANY APPLICABLE LAW, TO THE EXTENT AN IMPLIED WARRANTY CANNOT BE EXCLUDED AS PROVIDED IN THIS LIMITED WARRANTY, ANY IMPLIED WARRANTY IS LIMITED IN TIME TO THE SAME DURATION AS THE EXPRESS WARRANTY PERIOD SET FORTH ABOVE. BECAUSE SOME STATES DO NOT PERMIT LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THIS MAY NOT APPLY TO A GIVEN CUSTOMER. THIS LIMITED WARRANTY GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY HAVE OTHER LEGAL RIGHTS UNDER APPLICABLE LAWS.

This disclaimer shall apply even if the express warranty fails of its essential purpose.

In any cases of dispute the English original shall be taken as authoritative.

* Avanti service lift ("Product")

2. Introduction

2.1 Observations

Only trained people may use this lift.

This manual must be available to staff at all times during installation, maintenance and operation.

Additional copies are available from the manufacturer upon request.

All measurements are indicative only and subject to change without notice.



The pictures and sketches in this manual may not reflect the product aesthetics, colours, arrangement precisely. This has no impact on the function or safety.

2.2 Symbols

Symbol	Signal word	Meaning	Possible injury if not observed
--------	-------------	---------	---------------------------------

Safety instructions



DANGER!

IMMEDIATE or possibly imminent danger:

Death or severe injury!



DANGER!

IMMEDIATE or possibly imminent danger of hazardous voltage:

Death or severe injury!



CAUTION!

Potentially hazardous situation:

Light injury or material damage.

Additional instructions



ATTENTION!

Potentially dangerous situation:

Damage to equipment or workplace



IMPORTANT!

Useful tips for optimum working procedure

None



VERSION!

Differentiation between CE versions and AECO version.



Reference to written specification/documentation

2.3 Cautions

Use and daily inspection of the service lift shall only be performed by AVANTI or personnel authorised by AVANTI, hired by the employer for the job at hand. Installation and maintenance of the service lift shall only be performed by AVANTI or qualified personnel authorised by AVANTI, hired by the employer for the job at hand. Additionally, these tasks may be performed by qualified personnel authorised by a trainer authorised by AVANTI.

The personnel must be at least 18 years of age. The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

Personnel are obliged to read and understand this User's Manual.

Personnel shall wear PPE (safety helmet, full body harness, shock absorber, lanyard, slider, gloves and safety shoes) at all times.

A copy of the User's Manual must be handed out to the personnel and must always be available for reference.

If more than one person is entrusted with one of the above tasks, the employer shall appoint a supervisor in charge of the operation.

Self-locking nuts must be used at all times. The screw must extend from the nut by at least half of the thread diameter. The nut may not be used once it has become possible to loosen by hand!

If any damage or faults are found during operation, or if circumstances arise which may jeopardize safety: immediately interrupt the work in progress and notify the supervisor or employer!

All tests/repairs of electrical installations may only be performed by AVANTI or qualified personnel authorised by AVANTI.

All repairs to the traction, braking and supporting systems may only be performed by AVANTI or qualified personnel authorised by AVANTI.

If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by AVANTI or qualified personnel authorised by AVANTI.

Only original fault-free parts may be used. Use of non-original parts will render the AVANTI's

warranty void and any type approval invalid. No modification, extension or reconstruction of the service lift is allowed without the AVANTI's prior written consent.

No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts which are not approved by AVANTI.

Before using the lift perform an inspection by AVANTI or qualified personnel authorised by AVANTI.

Service lift must be inspected at least once a year by AVANTI or qualified personnel authorised by AVANTI. In case of high operating frequency or severe conditions of use, more frequent inspection is required.

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 12.5 h/year (250 h in total).

Service lift may not be used by persons who are under the influence of alcohol or drugs which may jeopardize working safety.

Service lift shall ONLY be used when the turbine is not generating power.

All wind farm site specific rules must be followed. Service lift shall not be used during inclement weather, including wind speeds over 18 m/s.

Personnel shall be equipped with a wired or wireless two way communication device, that shall be connected to a location staffed by authorised personnel ¹⁾. Personnel shall be equipped with portable lights, that shall provide 200 lx at control panel ¹⁾.



Avoid injury – follow all instructions!



The tower owner must verify the need for third party service lift inspections with the local authority and comply with the standards specified.



¹⁾ Optional for CE versions. Mandatory for AECO version.

3. Description

3.1 Purpose

The service lift purpose is to transport persons plus their tools and equipment to the most convenient height for performing work in wind turbine generators (WTG).

Its use is limited to personnel authorised by AVANTI holding the relevant training certificates.

The access to the WTG and consequently to the service lift is controlled and forbidden to public access.

The service lift is used primarily to transport technicians, their tools and spare parts from the bottom platform (or lowest accessible point) to the top platform (or highest accessible point).

It is also used to access intermediate platforms where inspection and service of WTG connecting bolts and other equipment is made.

3.2 Scope



This manual contains instructions for three different versions of the Pegasus lift:

- *Pegasus CE bucket type version and Pegasus CE full sliding door version, which are certified to Machinery Directive 2006/42/EC.*
- *Pegasus AECO version, which is certified to ASME A17.7/CSA B44.7-2007.*

The scope of the certificate is:

- a rack and pinion service lift,
- a ladder (mast),
- the necessary accessories to allow the connection to the WTG and the control and safety functions described in the manual. The accessories include: ladder supports (ties to the tower brackets), rest platforms, mechanical stops, safe zone plates, platform control boxes and other electrical equipment. It also includes the hardware necessary to make the connections, stickers and warning signs.
- and the platform fences.

The ladder sections, their supports, related accessories and platform fences may be assembled to the tower in the WTG factory and supplied later on site for final installation.

The service lift is supplied pre-assembled and may be supplied to the WTG factory or on site directly.

Final assembly, adjustment, installation and verification of the service lift shall be made on site.

3.3 Exclusions

A declaration of conformity of the complete system integrated in the WTG can only be issued after the system has been fully incorporated. In case the necessary information for the evaluation is not supplied to AVANTI, a declaration of incorporation shall be issued.

In such case, equipment with missing information shall be specifically out of the scope of the certificate, but will be needed for the safe integration and use of the service lift. The WTG manufacturer will be responsible for ensuring full compliance of the system once integrated in the tower. To do so, the instructions and WTG requirements stated in this manual shall be observed.

For example, the emergency lighting along the WTG shall be considered, in order to guarantee a safe evacuation from WTG in case of emergency.



The WTG manufacturer's risk assessment shall include a service lift integration study.



The service lift must not be used outdoor or in potentially explosive atmospheres.

3.4 Technical specifications

Service lift		CE versions	AECO version
Cabin type		Bucket type ²⁾ , front fence (1.1 m) with double door Full sliding door	Full sliding door
Service lift speed		19.4 m/min \pm 10 % (50 Hz) 17.4 m/min \pm 10 % (60 Hz)	17.4 m/min \pm 10 % (60 Hz)
Working load limit / N° persons (max)		250 Kg / 2 Persons	250 Kg / 2 Persons
Travelling height		150 m	150 m
Operating temperature ¹⁾	Standard	-15°C to +60°C	-15°C to +60°C
	Low	-25°C to +40°C	-25°C to +40°C
Survival temperature ¹⁾		-30°C to +80°C	-30°C to +80°C
Traction system type		Rack and pinion	Rack and pinion
Max.noise level		80 dB (A)	80 dB (A)
Power supply		3 kW, 16 A 3 Phase 400V, 50Hz / 60Hz	3 kW, 16 A 3 Phase 400V, 60Hz
IP protection / NEMA type ¹⁾		min. IP 54	Type 4
Control voltage		24 VAC	24 VAC

¹⁾Note: for special working conditions, check with the manufacturer

Traction system		CE versions	AECO version
Power		2 x 1.5 kW	2 x 1.5 kW
Gear box ratio		1 : 15 (50 Hz)- 1 : 20 (60 Hz)	1 : 20 (60 Hz)
Rack / Pinion module		6	6
Centrifugal brake limiting speed		24 m/min	24 m/min
Dimensions		220 x 225 x 580 mm	220 x 225 x 580 mm
Weight by motor group		30 Kg	30 Kg
Motor speed		1400 rpm (50 Hz) – 1680 rpm (60 Hz)	1680 rpm (60 Hz)
Nominal current		2 x 3.7 A	2 x 3.7 A
Start current		2 x 18.5 A	2 x 18.5 A

Cabin		CE versions	AECO version
Cabin weight		225 kg	225 kg
Outer dimensions (W x D x H)		996 x 777 x 2850 mm	
Outer dimensions without top frame		996 x 777 x 2642 mm	996 x 777 x 2642 mm
Inner dimensions (W x D x H)		976 x 481 x 2232 mm	976 x 481 x 2232 mm
Door opening of bucket type (W x H)		920 x 1100 mm	
Door opening of full sliding door (W x H)		564 x 1988 mm	564 x 1988 mm
Top hatch dimensions (W x D)		640 x 400 mm	640 x 400 mm
Bottom hatch dimensions (W x D)		600 x 400 mm	600 x 400 mm
Lateral windows ²⁾ dimensions (W x H)		280 x 810 mm	

Power & Control cable		CE versions	AECO version
Type	Bottom platform to junction box	18 G 2.5	7 G 4 + 12 G 1.5
	Top platform to junction box	8 G 1.5	12 G 1.5
	Travelling cable	1 x 8 G 2.5 + 1 x 10 G 1.5	7 G 4 + 12 G 1.5
Travelling cable weight (approx.)		0.6 kg/m	0.5 kg/m

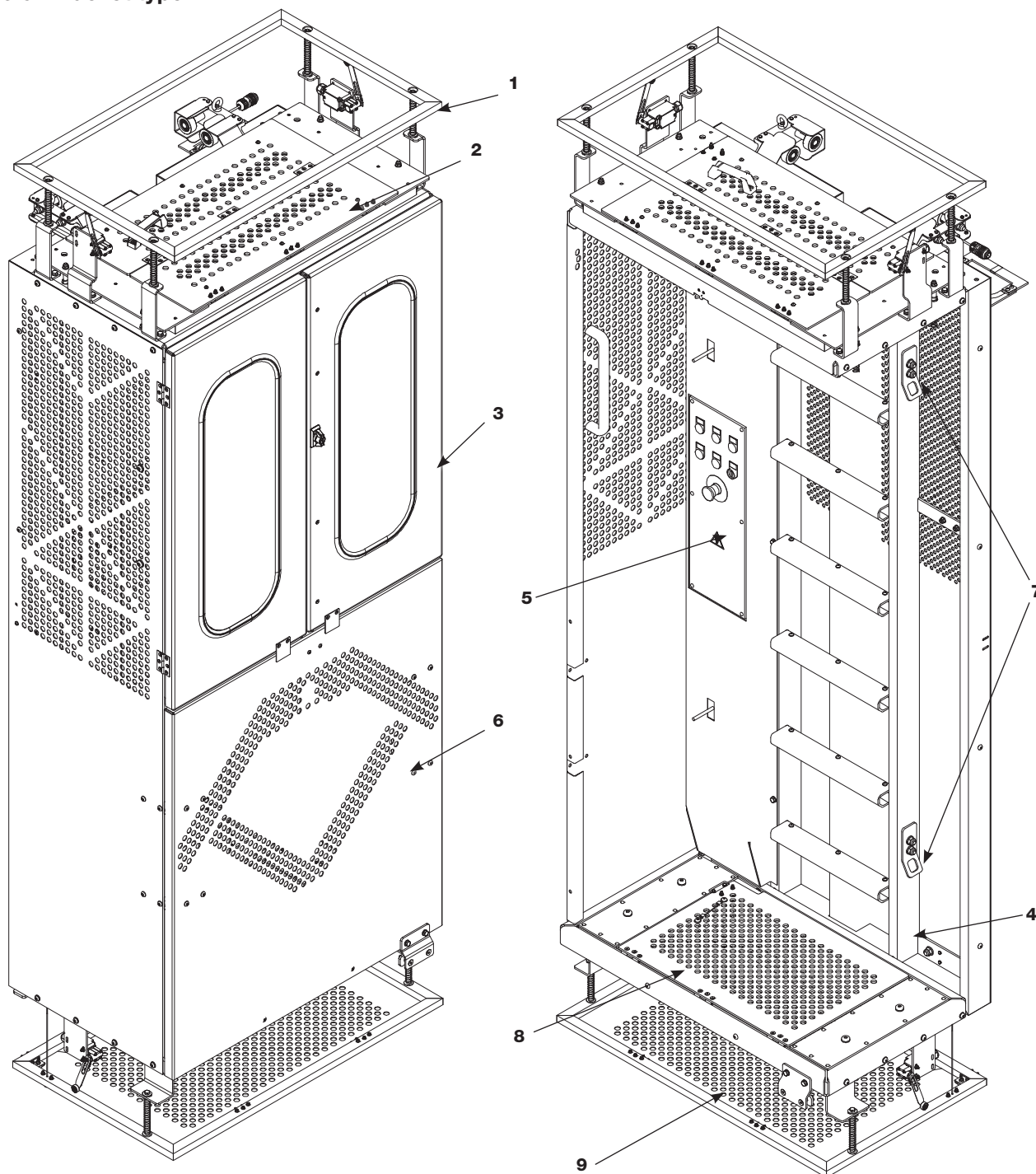
Ladder rack (Mast)		CE versions	AECO version
Dimensions		530 x 30 x 1489 mm / 530 x 30 x 2978 mm	530 x 30 x 1489 mm / 530 x 30 x 2978 mm
Weight (per piece)		15 kg / 30 kg	15 kg / 30 kg
Attachment distance		1 per mast section, max. 3000 mm	1 per mast section, max. 2100 mm



²⁾ Note: Optional for CE versions.
Not available for AECO version.

3.5 Service lift overview

3.5.1 Bucket type ¹⁾



- 1. Top obstruction device (frame) ¹⁾
- 2. Top hatch
- 3. Double door
- 4. Main frame
- 5. Cabin control box

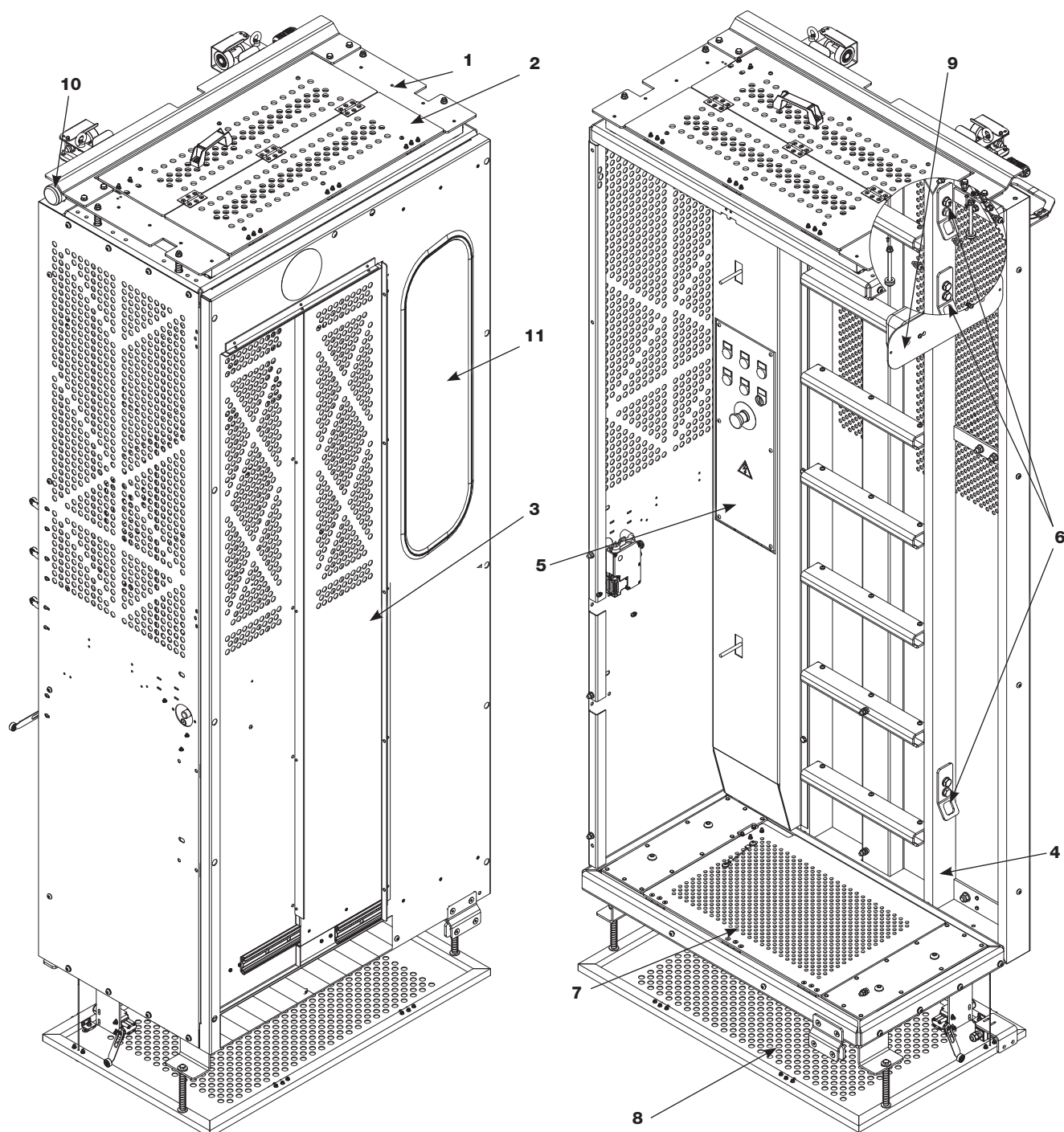
- 6. Fixed front
- 7. Anchor points for PPE (x2)
- 8. Bottom cabin hatch
- 9. Bottom obstruction device
- 10. Internal light ²⁾
- 11. Warning lights (x2) ²⁾

¹⁾ Optional for CE versions. Not available for AECO version.

²⁾ Optional for Pegasus CE versions. Mandatory for AECO version.



3.5.2 Full sliding door ¹⁾



1. Top obstruction device (roof)

2. Top hatch

3. Full sliding door

4. Main frame

5. Cabin control box

6. Anchor points for PPE (x3)

7. Bottom cabin hatch

8. Bottom obstruction device

9. Internal light ¹⁾

10. Warning lights (x2) ¹⁾

11. Front window ²⁾

12. Top obstruction device (frame) ³⁾

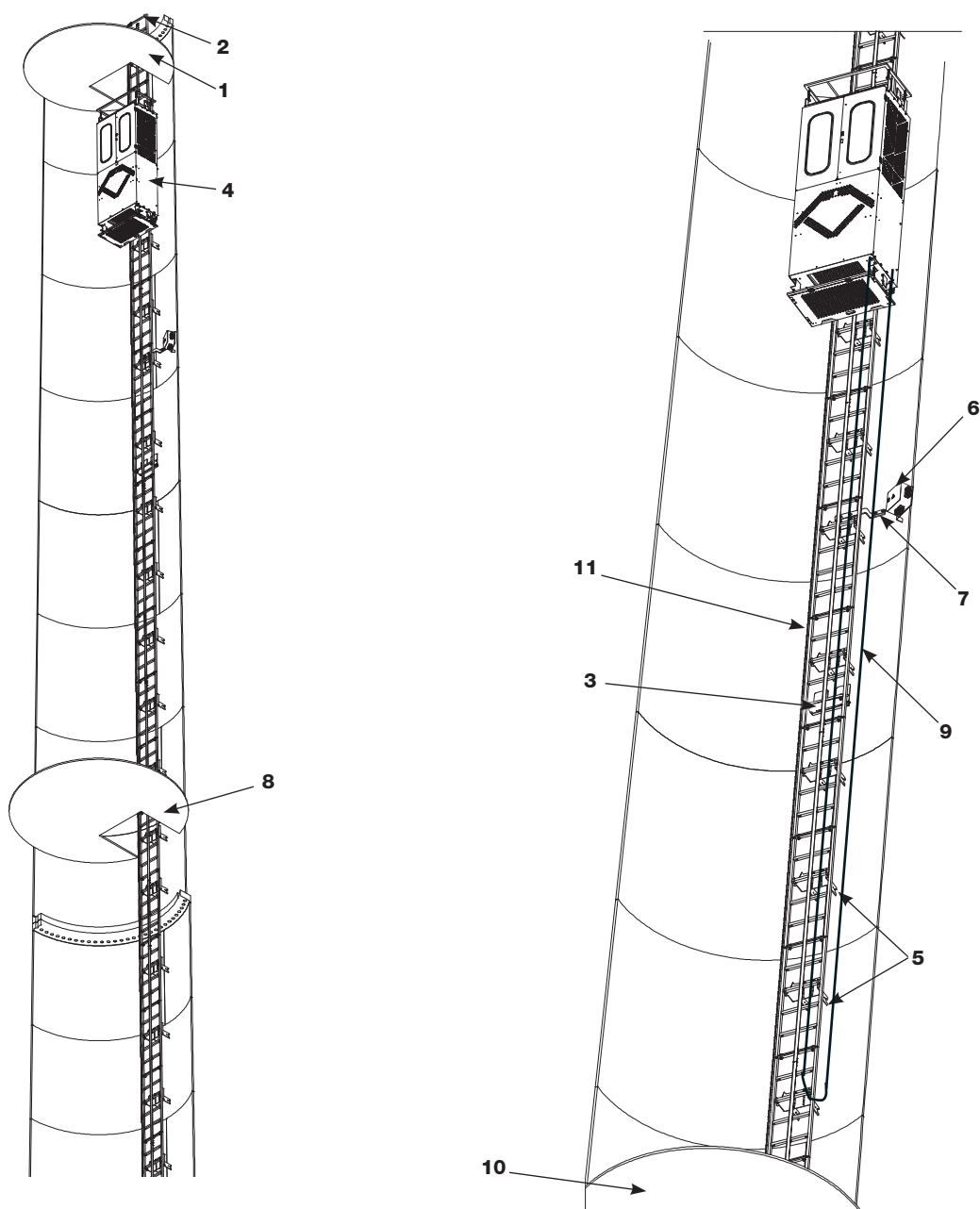
¹⁾ Optional for CE versions. Mandatory for AECO version.

²⁾ Optional for CE versions and for AECO version.

³⁾ Optional for CE versions. Not available for AECO version.

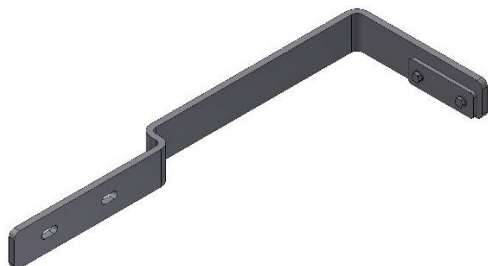


3.6 General arrangement of Pegasus lift inside a generic WTG



INTERMEDIATE ARM FOR ELECTRIC CABLE

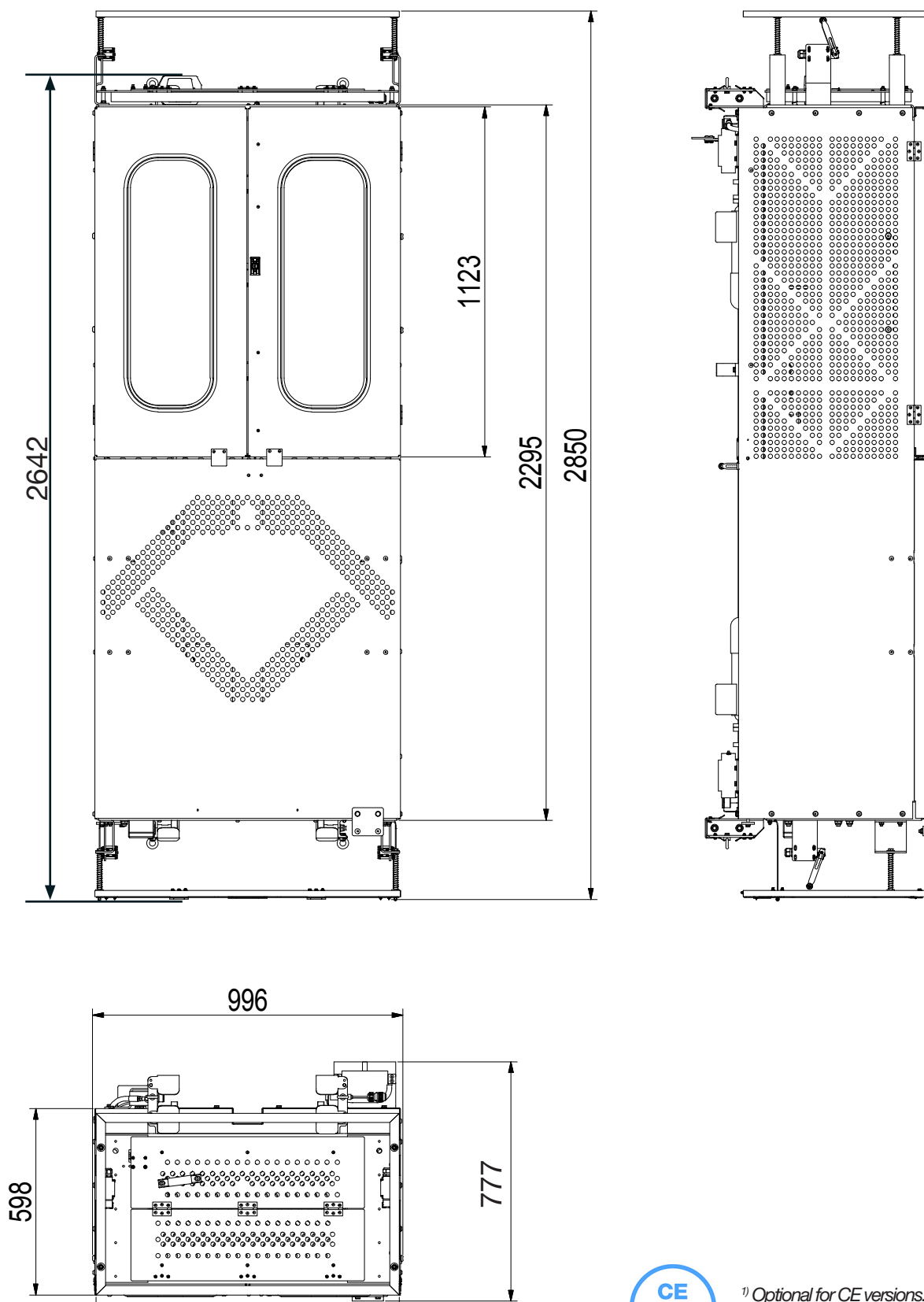
This bracket is screwed to one of the anchorages of the installation. It is installed above the middle of the tower height, in order to allow the proper reeving of the electrical cable.



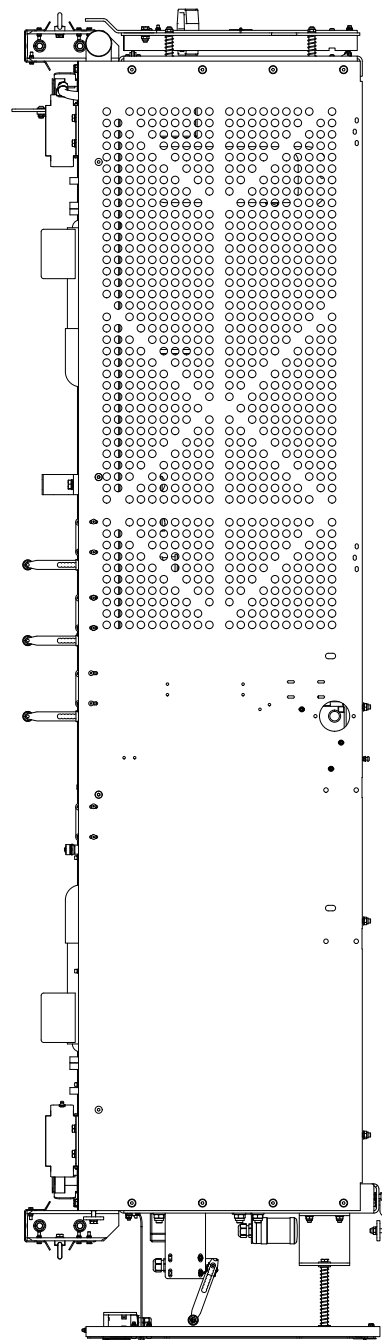
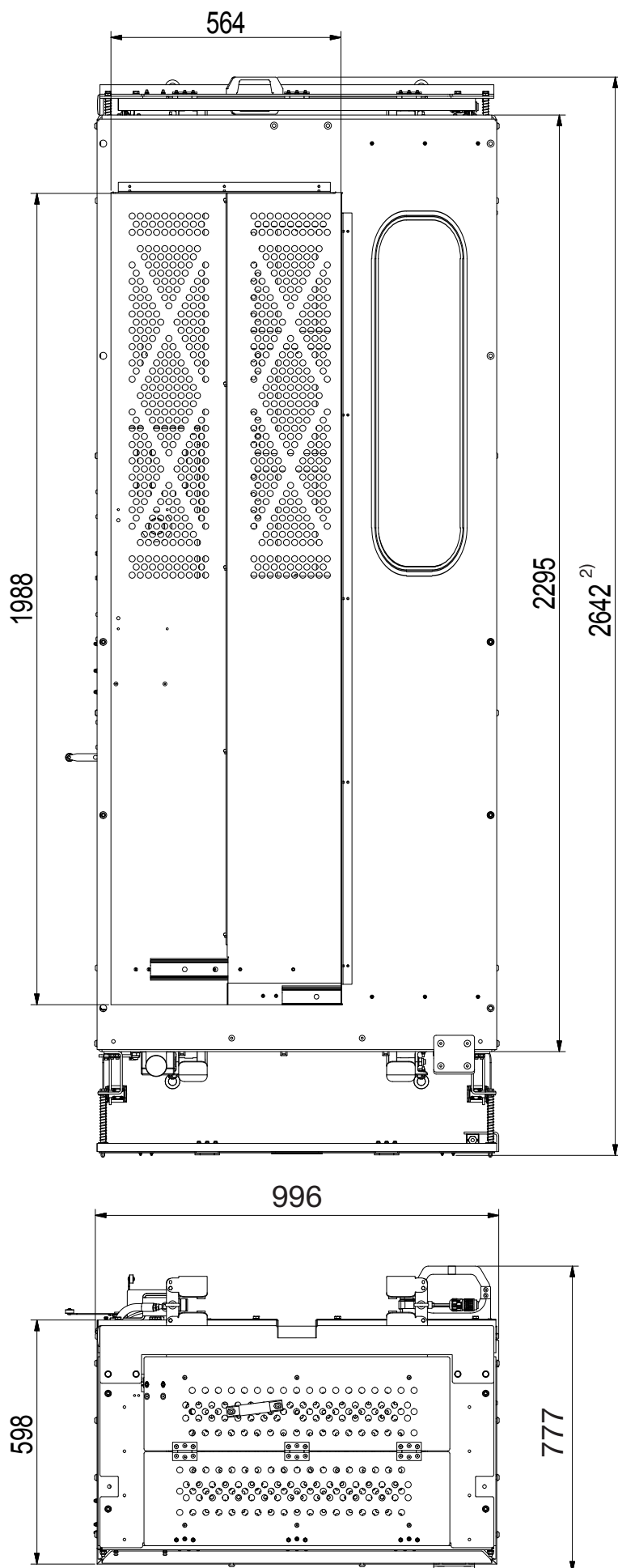
1. Top platform
2. Top mechanical stop
3. Rest platform
4. Pegasus service lift
5. Anchorages
6. Junction box
7. Intermediate arm for electric cable
8. Intermediate platform
9. Travelling cable
10. Bottom platform
11. Ladder rack

3.7 Service lift dimensions

3.7.1 Bucket type ¹⁾



3.7.2 Full sliding door ¹⁾



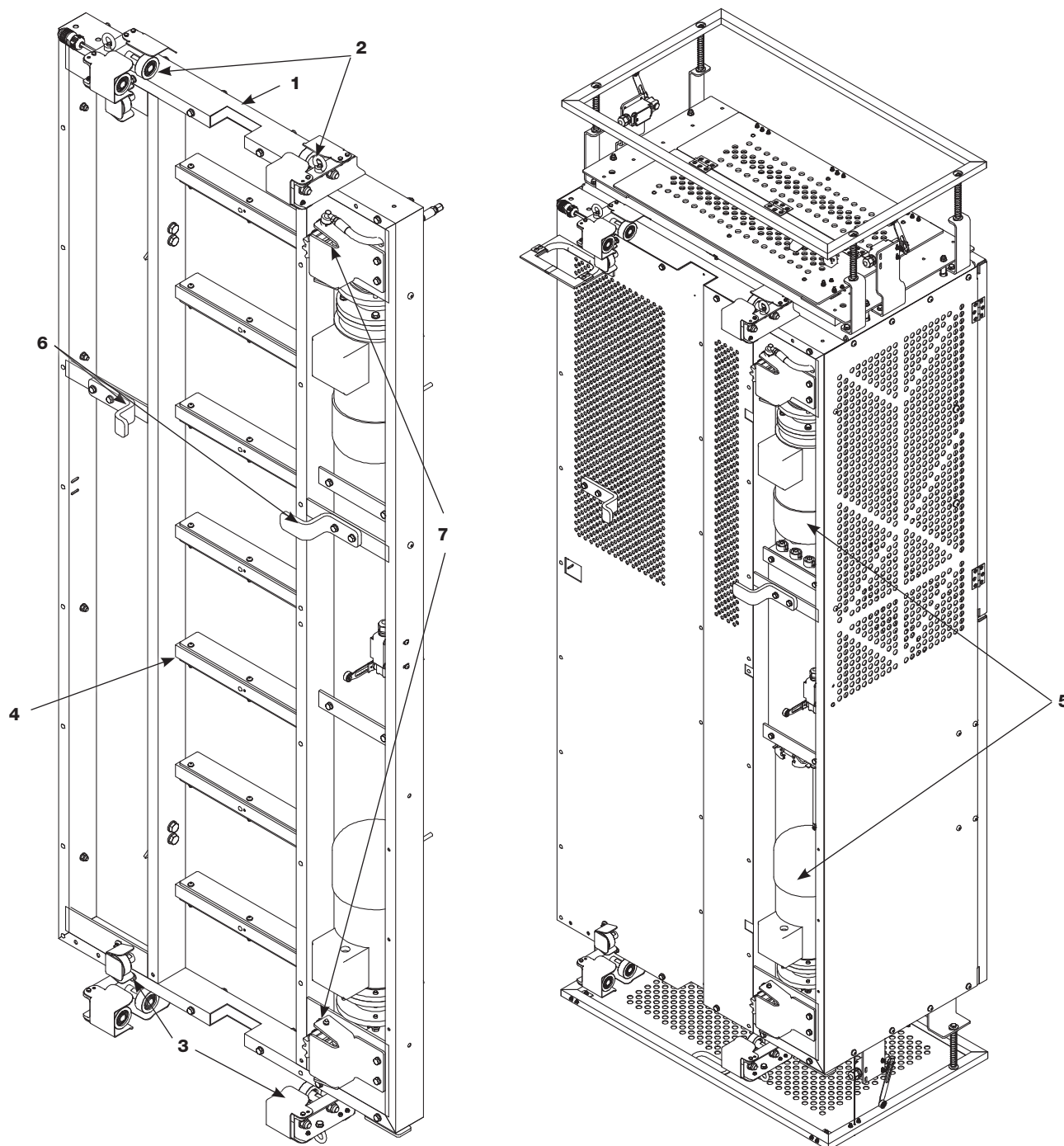
¹⁾ Optional for CE versions. Mandatory for AECO version.

²⁾ If top obstruction device (frame) ³⁾ is installed, height is 2850 mm.

³⁾ Optional for CE versions. Not available for AECO version.

3.8 Main frame

The main frame is a welded steel structure. The traction and guiding systems are bolted to the main frame.

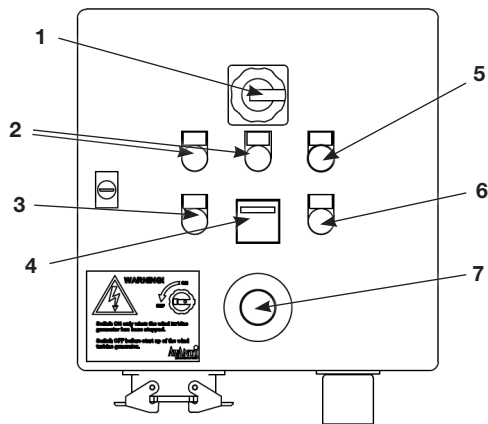


1. Main frame
2. Guiding rollers top
3. Guiding rollers bottom
4. Evacuation ladder
5. Traction system/ 2 Motor groups
6. Anti-derailment brackets
7. Pinions

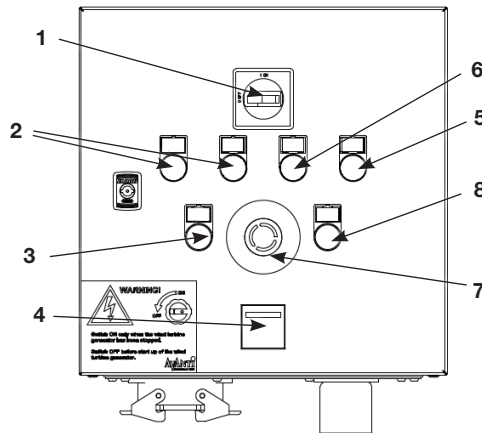
3.9 Controls

3.9.1 Bottom platform control box

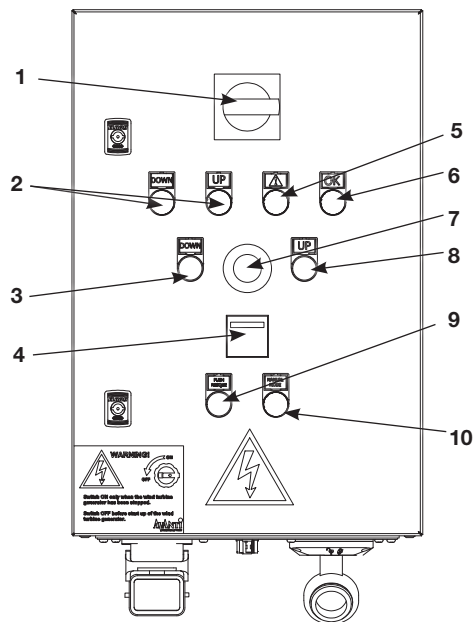
CE Call only configuration:



CE Send ¹⁾ and call configuration:



AECO configuration:



1. ON/OFF MAIN SWITCH

2. UP/DOWN LIGHTS (GREEN)

Lights up when the lift is going up or down respectively.

3. DOWN BUTTON

Press and hold DOWN button to call the lift to the bottom platform.

4. HOUR COUNTER

5. FAULT LIGHT (RED)

Lights up when there is an activated switch on the safety circuit i.e: Open door, emergency stop pressed, open hatch or the ON/OFF buttons of the cabin control box is not in the ON position.

6. READY LIGHT (GREEN)

Lights up when the box has electric current.

7. EMERGENCY STOP BUTTON

Press to interrupt any control function. Turn/pull to reset the control after necessary verifications.

8. UP BUTTON

Press and hold UP button to send the lift to the top platform.

9. RESCUE BUTTON ²⁾

Press this button to enable send ¹⁾ and call functions in case of rescue. This selector is sealed and is for emergency use only.

10. MANUAL MODE LIGHT ³⁾

Lights up when the MANUAL/AUTO selector ²⁾ of the cabin control box is left in MANUAL position.

Optionally, send ¹⁾ and call buttons can have a delayed response function and a buzzer can be included on the cabin control box. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.



¹⁾ Optional for CE versions and for AECO version.

²⁾ Not available for CE versions. Mandatory for AECO version.

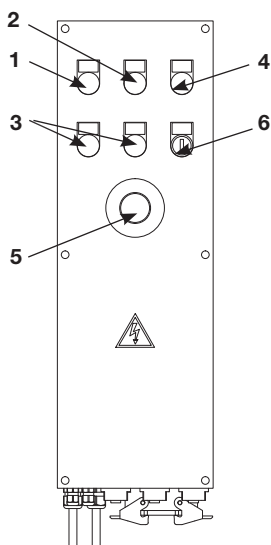
³⁾ Not available for CE versions. Optional for AECO version.

3.9.2 Cabin control box

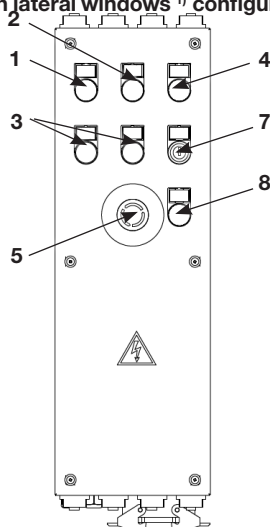


Cabin control box inside the cabin has control priority over control boxes at platforms.

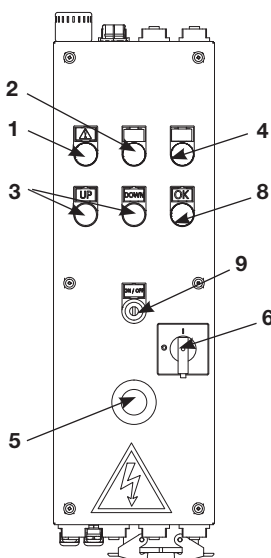
CE without lateral windows ¹⁾ configuration:



CE with lateral windows ¹⁾ configuration:



AECO configuration:



1. FAULT LIGHT (RED)

Lights up when there is an activated switch on the safety circuit i.e: Open door, emergency stop pressed, open hatch or the ON/OFF buttons of the cabin control box is not in the ON position.

2. PLATFORM LIGHT (GREEN)

Lights up when lift reaches the bottom or top platform.
If top obstruction device (frame) ¹⁾ is provided: the light lights up when lift reaches bottom or top platform; or when bottom or top obstruction devices are activated.
If platform switch (S18) ²⁾ is provided: the light lights up when lift reaches any platform.

3. UP/DOWN BUTTONS

Press and hold the “UP” or “DOWN” button, when you are inside the cabin to go up or down.

4. OVERLOAD LIGHT (YELLOW)

Lights up when the cabin is overloaded.

5. EMERGENCY STOP BUTTON

Press to interrupt any control function.
Turn/pull to reset the control after necessary verifications.

6. ON/OFF SELECTOR (GREEN)

Select ON position, then the control box has electric current and the light lights up. Select OFF position, then the control box has not electric current and the light does not light up.

7. CABIN KEY LOCK

8. READY LIGHT (GREEN)

Lights up when the box has electric current.

9. TRAPPED KEY LOCK

Insert the trapped key and turn to ON position, then the control box has electric current.

10. MANUAL/AUTO SELECTOR ⁴⁾

Turn to MANUAL position to interrupt control from platform control boxes.
Turn to AUTO position to interrupt control of cabin control box.

Optionally, a buzzer can be included on the cabin control box and the send ³⁾ and call buttons of platform control boxes can have a delayed response function. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.



¹⁾ Optional for CE versions. Not available for AECO version.

²⁾ Optional for CE bucket type version.

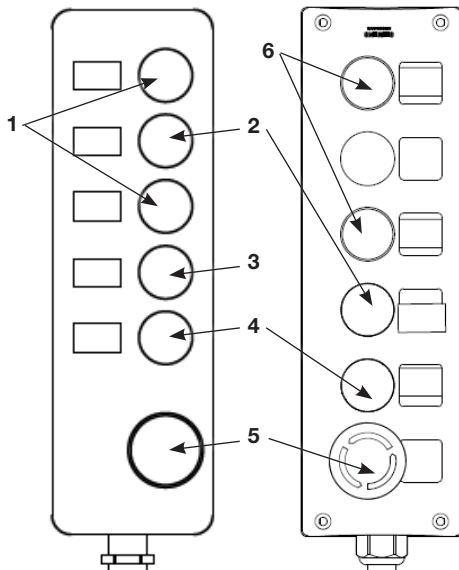
Mandatory for CE full sliding door version and for AECO version.

³⁾ Optional for CE versions and for AECO version.

⁴⁾ Not available for CE versions. Mandatory for AECO version.

3.9.3 Top platform control box

CE Call only configuration:



1. UP/DOWN LIGHTS (GREEN)

Shine when the lift is going up or down respectively.

2. READY LIGHT (GREEN)

Lights up when the box has electric current.

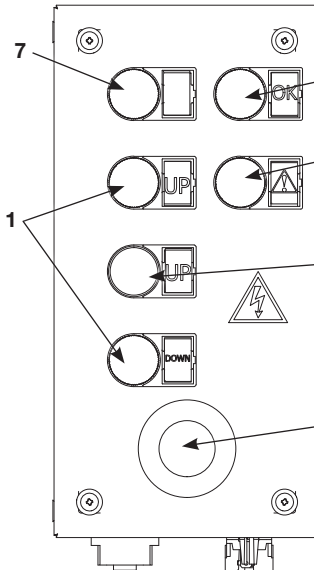
3. UP BUTTON

Press and hold the UP button to call the service lift.

4. FAULT LIGHT (RED)

Lights up when there is an activated switch on the safety circuit i.e: Open door, emergency stop button pressed, open hatch or the ON/OFF selector of the cabin

CE Send ¹⁾ and call configuration:



control box is not in the ON position.

5. EMERGENCY STOP BUTTON

Press to interrupt any control function.

Turn/pull to reset the control after necessary verifications.

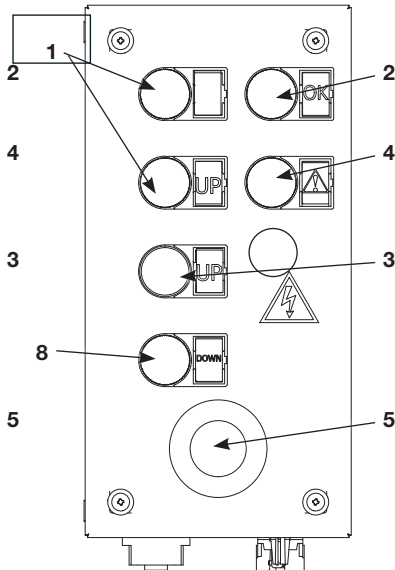
6. UP/DOWN LIGHT BUTTONS (GREEN)

Press and hold UP/DOWN light-buttons to ascend or descend the service lift respectively. UP/DOWN light-buttons shine when the lift is ascending or descending respectively.

7. PLATFORM LIGHT (GREEN)

Lights up when lift reaches the top platform.

AECO Call only configuration:



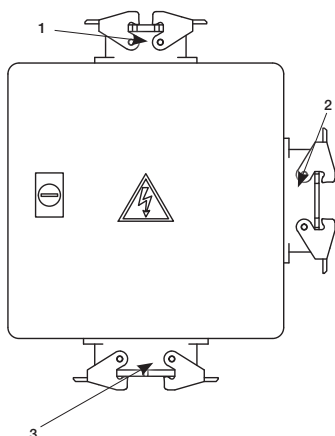
8. DOWN BUTTON

Press and hold the DOWN button to send the service lift.

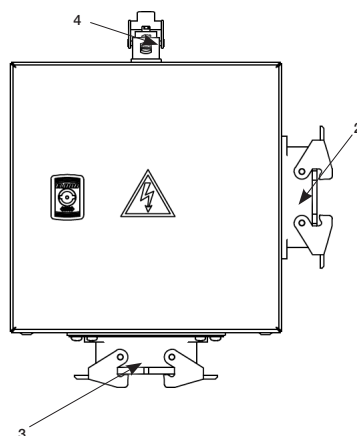
Optionally, send ¹⁾ and call buttons can have a delayed response function and a buzzer can be included on the cabin control box. This way, persons next to or inside the cabin are warned of imminent movement of service lift and can act accordingly.

3.9.4 Mid tower junction box

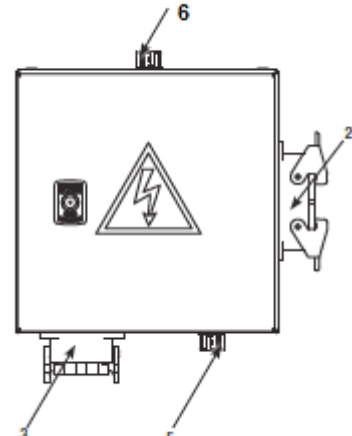
CE Call only configuration :



CE Send ¹⁾ and call configuration:



AECO configuration:



1. 10 pin connector for electrical round cable

To connect to top platform control box.

2. Connector for travelling flat cable

To supply electric power to the cabin.

3. Connector for electrical round cable

To connect to bottom platform control box.

4. 12 pin connector for electrical round cable

To connect to top platform control box.

5. Connector for control signal.

To connect to bottom platform control box.

6. Connector for control signal.

To connect to top platform control box.



¹⁾ Optional for CE versions and for AECO version.

3.10 Service lift doors

3.10.1 Double door¹⁾

Main access to the service lift is done through the double door system installed on the front. The system consists of two hinged doors that open outwards. This door can be opened at any time. A safety switch monitors the closed function and interrupts control if the door is opened.

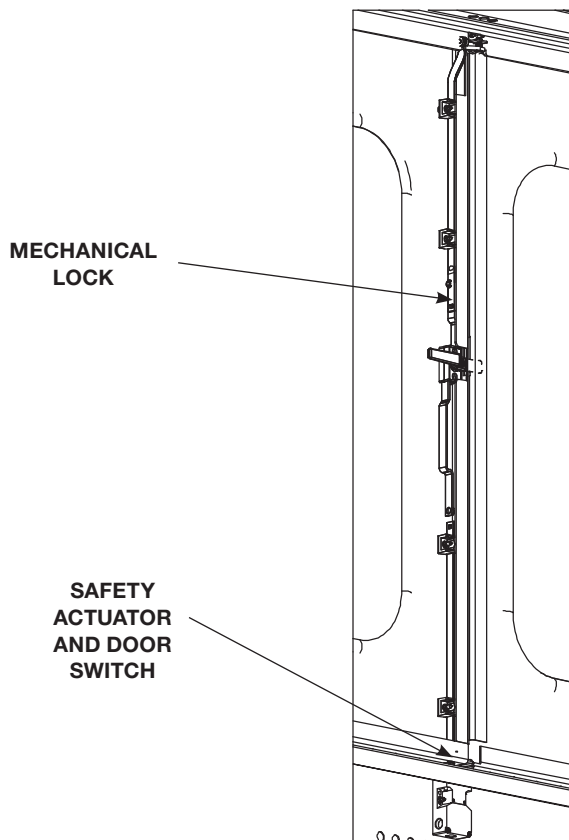


When the door is open, user(s) MUST BE attached with the shock absorber to an anchor point.

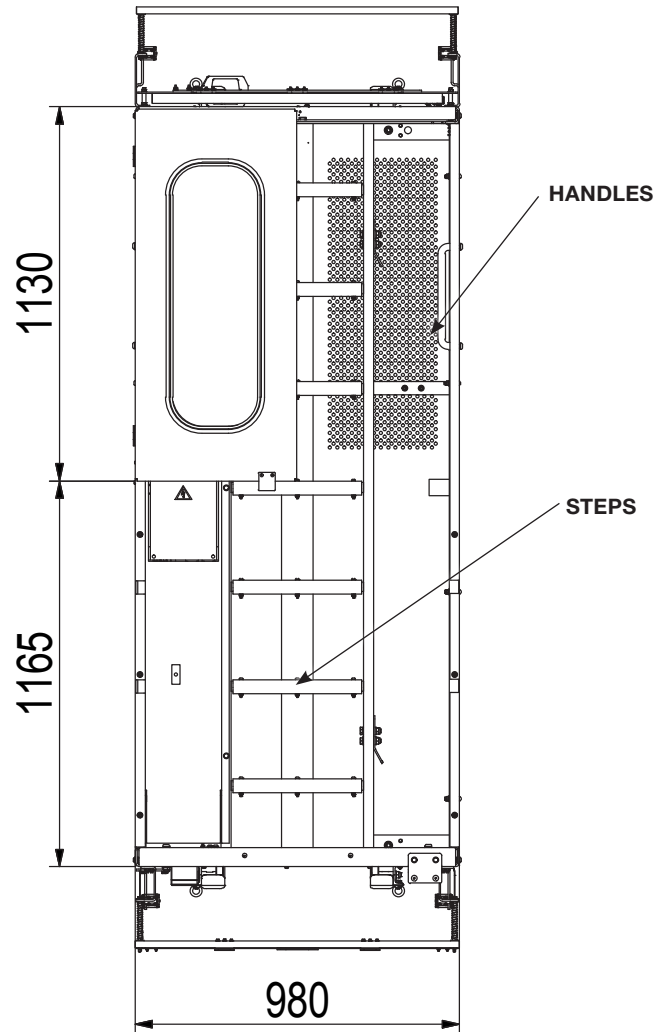
A mechanical lock is also installed to lock the doors together to the fixed front.

From outside: turn the key clockwise to open the door, and anticlockwise to close it.

From inside: turn the lever anticlockwise to open the door, and clockwise to close it.



If the doors are not closed properly, the fault light illuminates. The steps inside the cabin are provided with non-slip surface in order to prevent the risk of falling.



¹⁾ Optional for CE versions.
Not available for AECO version.

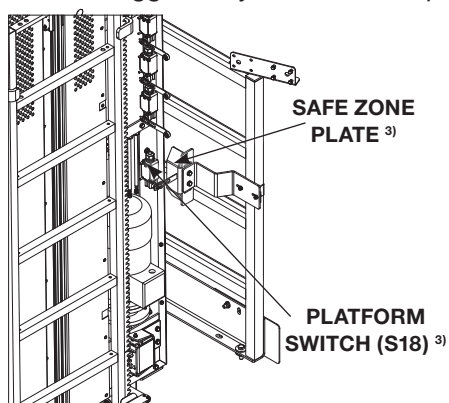
3.10.2 Full sliding door ¹⁾

It consists of two perforated sheets that slide horizontally.

3.10.2.1 Guard locking configuration ²⁾

It features a guard locking system ²⁾ that:

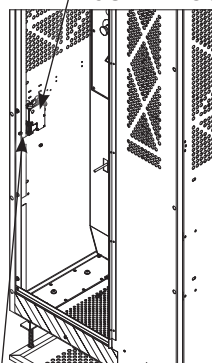
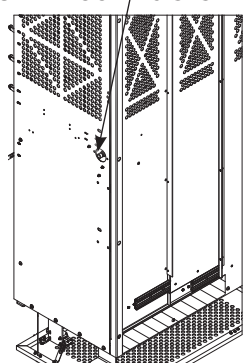
- Prevents service lift to travel if the door is open. This opening condition is monitored by the guard locking switch (S19.3) ²⁾.
- Permits door to be opened only when service lift is levelled with a platform. This levelling condition is monitored by the platform switch (S18) ³⁾ which is triggered by the safe zone plates ³⁾.



It is possible to manually release the guard locking system ²⁾ in order to open the door between platforms for maintenance tasks or installation of WTG parts.

EXTERNAL MANUAL RELEASE OF GUARD LOCKING SYSTEM ²⁾

INTERNAL MANUAL RELEASE OF GUARD LOCKING SYSTEM ²⁾



GUARD LOCKING SWITCH (S19.3) ²⁾

3.10.2.2 Interlock without monitoring configuration ⁴⁾

It features an interlock without monitoring ⁴⁾ that does not allow the door to be opened involuntarily.

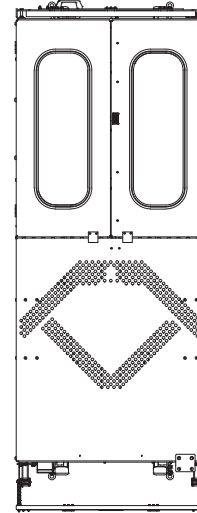
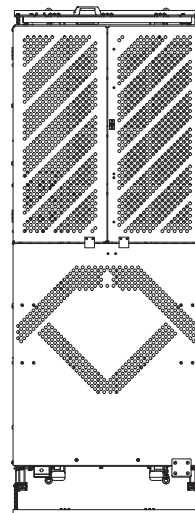
In order to open the door, the user must actuate a manual release button, which is accessible from the inside and the outside of the cabin.

3.11 Front windows

The service lift features perforations that allow visibility inside the cabin. Additionally, the service lift may feature front windows to improve visibility.

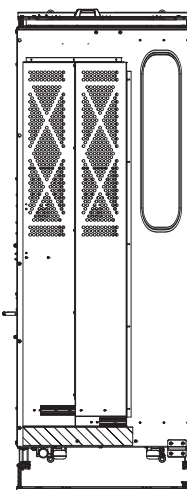
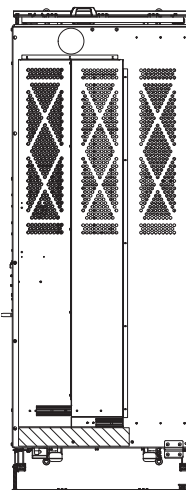
Bucket type without windows ⁵⁾:

Bucket type with windows ⁵⁾:



Full sliding door without windows ⁶⁾:

Full sliding door with windows ⁶⁾



¹⁾ Optional for CE versions. Mandatory for AECO version.

²⁾ Mandatory for CE full sliding door version. Not available for AECO version.

³⁾ Optional for CE bucket type version. Mandatory for CE full sliding door version. Optional for AECO version.

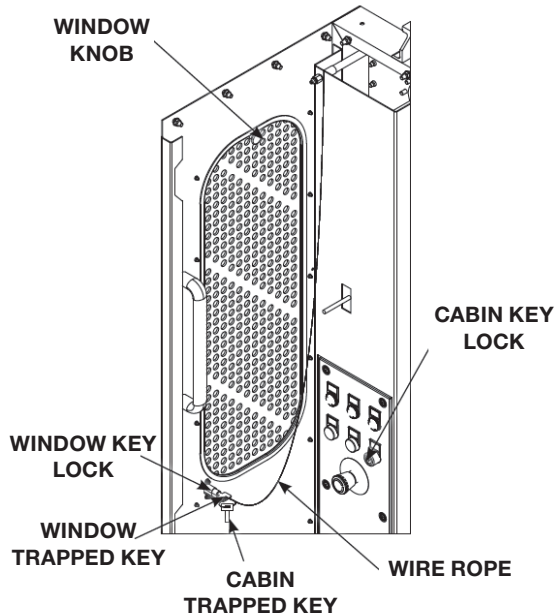
⁴⁾ Not available for CE full sliding door version. Mandatory for AECO version.

⁵⁾ Optional for CE bucket type version.

⁶⁾ Optional for CE full sliding door version. Optional for AECO version.

3.12 Lateral windows ¹⁾

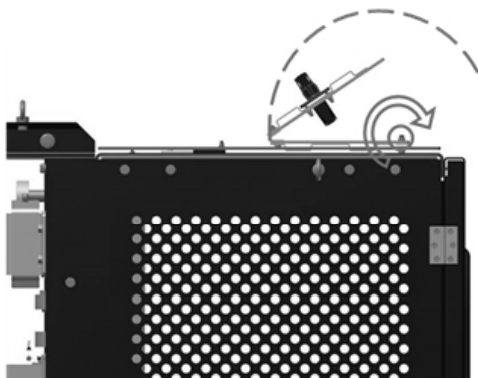
Optionally, the service lift can be equipped with lateral windows ¹⁾. These windows facilitate service tasks of tower internals from inside the cabin. In order to open a window, the cabin trapped key must be removed and the window trapped key must be used. Both trapped keys are attached to the same wire rope, this way service lift cannot travel if a window is open.



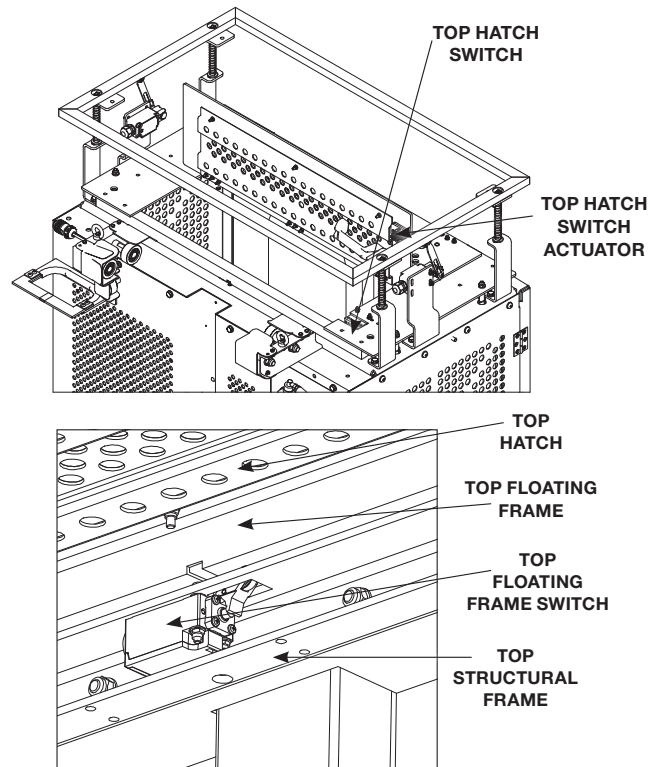
Cabin trapped key and window trapped key shall be attached to the same wire rope at all times.

3.13 Top hatch

The top hatch consists of a double hinged sheet, that minimizes necessary space to open it. This hatch is used to evacuate the service lift or to access the top platform.

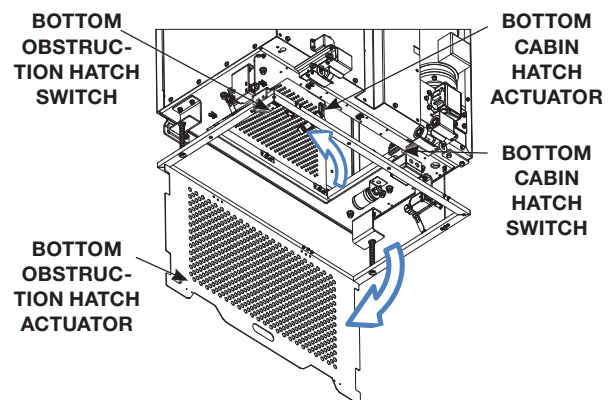


The dimensions of the clear opening are 640 x 400 mm. A switch interrupts control if the hatch is open or not properly closed. In this case the fault light illuminates. The top hatch is mounted over a top floating frame. If a person stands on the top floating frame, a switch is triggered and control is interrupted. This prevents misuse of the service lift; e.g. persons riding on top.



3.14 Bottom hatches

The bottom cabin hatch and the bottom obstruction hatch consist of a perforated sheet that open inwards and outwards respectively. They are used in case of evacuation. A corresponding switch interrupts control if one these hatches is opened or not closed properly. In this case the fault light of the cabin control box illuminates. The dimensions of the clear opening are 600 x 400 mm.



¹⁾ Optional for CE versions.
Not available for AECO version.

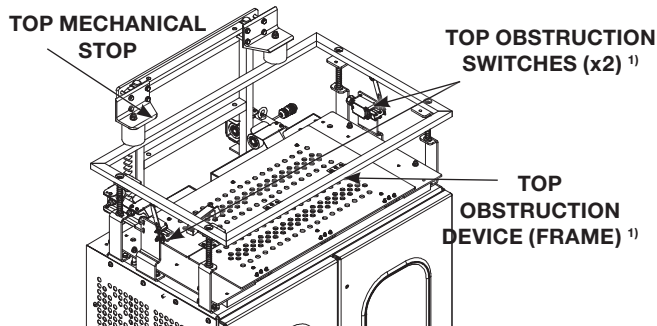
3.15 Top obstruction device

3.15.1 Frame configuration ¹⁾

The top obstruction device (frame) interrupts ascent if:

1. It encounters an obstacle.
2. It reaches the top platform.

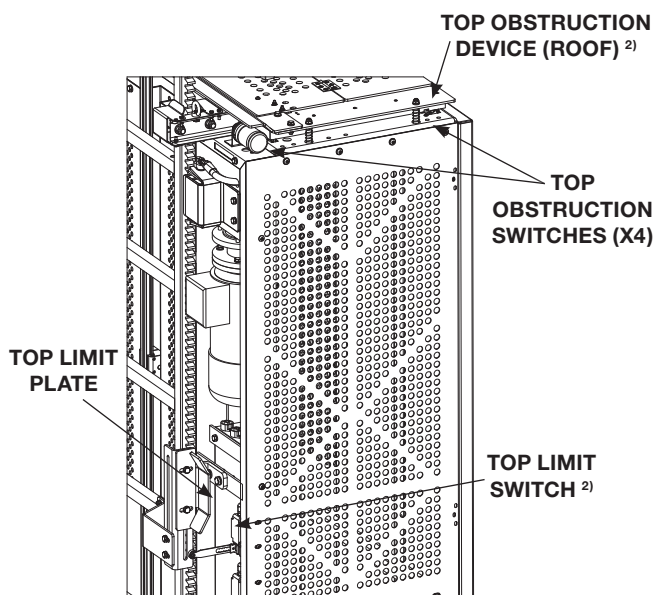
Descent is still possible; i.e. to remove the obstacle.



3.15.2 Roof configuration ²⁾

The top obstruction device (roof) ²⁾ interrupts control if it encounters an obstacle.

The top limit switch ²⁾ interrupts ascent if the service lift reaches top platform.



3.16 Bottom obstruction device

3.16.1 Without bottom limit switch configuration ³⁾

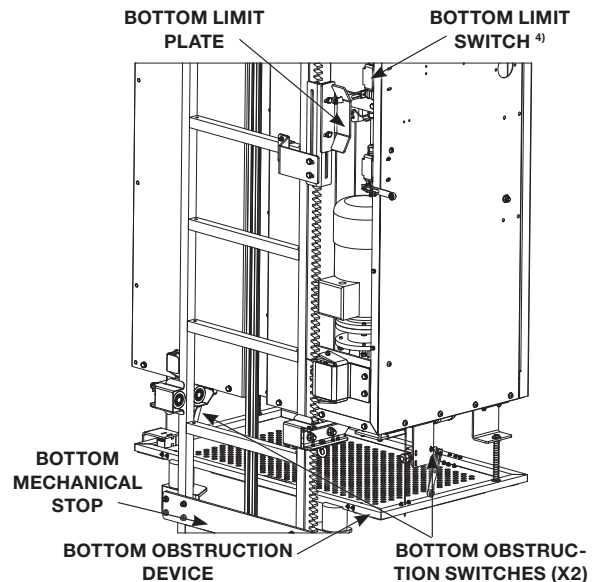
The bottom obstruction device interrupts descent if:

1. It encounters an obstacle.
2. It reaches the bottom platform.

Ascent is still possible; i.e. to remove the obstacle.

3.16.2 With bottom limit switch configuration ⁴⁾

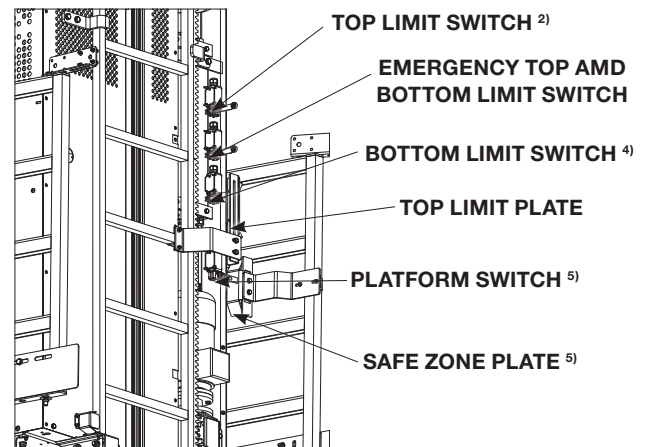
The bottom obstruction device interrupts descent if it encounters an obstacle. The bottom limit switch ⁴⁾ interrupts descent if the service lift reaches the bottom platform.



3.17 Emergency top and bottom limit switch

The emergency top and bottom limit switch interrupts the control if top limit switch ²⁾ or top obstruction switches fail, or if bottom limit switch ⁴⁾ or bottom obstruction switches fail.

This switch is triggered by the bottom limit plate and top limit plate located at bottom and top platforms respectively. To release the switch at bottom platform: temporarily remove the switch lever, put the lever back afterwards and verify adjustment. To release the switch at top platform, perform manual descent some metres.



3.18 Top and bottom mechanical stops

Top and bottom mechanical stops are installed on the ladder and act as travel limits.



¹⁾ Optional for CE versions. Not available for AECO version.

²⁾ Optional for CE versions. Mandatory for AECO version.

³⁾ Mandatory for CE versions. Optional for AECO version.

⁴⁾ Not available for CE versions. Optional for AECO version.

⁵⁾ Optional for CE bucket type version. Mandatory for CE full sliding door version. Mandatory for AECO version.

3.19 Traction system

The traction system is rack and pinion type. The system has two motor group working on the same rack. They are installed on the main frame of the cabin. Each motor groups has a centrifugal brake, a gear box, a pinion and a brake motor. Each motor brake includes a manual release lever allowing a manual descent in absence of electric current.

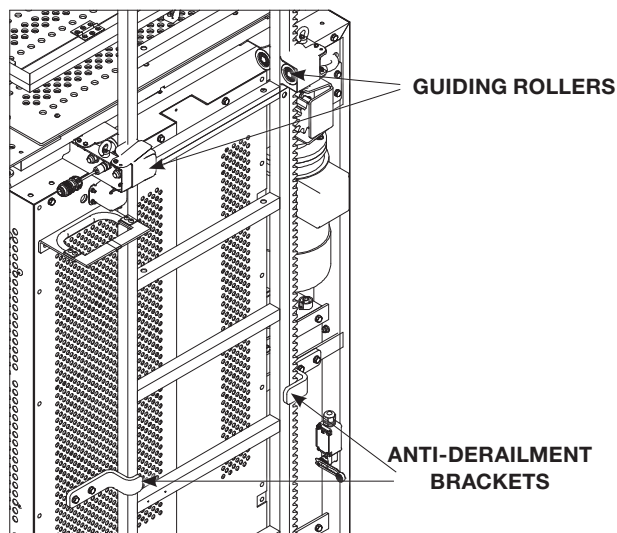


3.20 Guiding and anti-derailment system

The service lift is guided along the stiles of a ladder by means of ten guiding rollers.

An inductive sensor detects the presence of the stile. If the stile is not detected (bigger distance than setting), control is interrupted, avoiding derailment of the service lift.

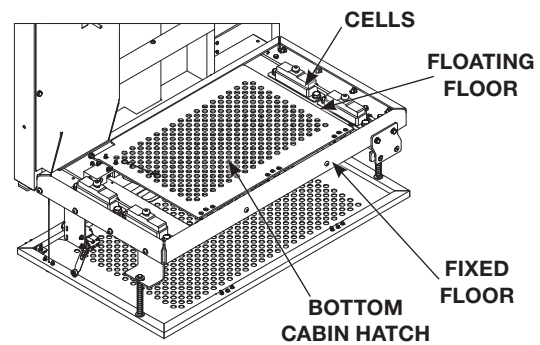
The service lift features two anti-derailment brackets that prevent derailment if guiding rollers fail.



3.21 Overload limiter

The overload detection system prevents any movement of the service lift in the event of an overload. In case of an overload, the overload light (yellow) lights up.

This system consists of a floating floor with four load cells. The load cells send the load signal to the electronic equipment of the cabin control box.

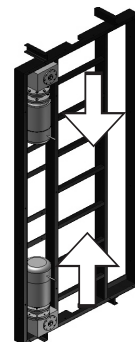


3.22 Manual descent system

Each motor group features a hand lever, that allow manual release of the motor electromagnetic brake. Once the motor brakes are released, the service lift descends with a controlled speed limited by the centrifugal brake installed in each motor group.



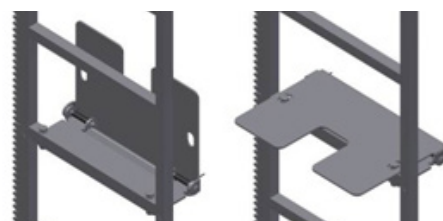
Push hand levers upwards and downwards at the same time to perform manual descent and always look through the perforated sheet holes.



3.23 Rest platforms

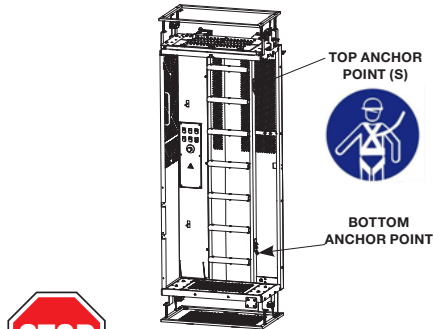
There is a rest platform at least every 6 metres. The rest platforms are attached to the ladder on the ladder section connection.

Rest platforms are self folding using torsion springs so they do not interfere with the cabin movement when they are not used.



3.24 Anchor points for PPE

The service lift is equipped with two anchor points inside the cabin in bucket type version and three anchor points in full sliding door versions. In case of evacuation, the evacuation procedure must be followed (see “Appendix A: Safety measures”).



Each anchor point may only be used by one user simultaneously.

3.25 Information signs and documents

The following documents, signs and stickers are supplied with the service lift and shall always be available.

Document	Position
Serial number plate	Inside the cabin.
Manual	Inside the blue bag.
Quick guide	Inside the cabin.
Use of PPE sticker	On the motor cover.
Work load / N° persons sticker	On the front side of cabin.
Warning risk of falling sticker	On the motor cover.
Warning risk of crushing sticker (x2)	On the pinion covers.
Manual descent sticker	On the motor cover.
Wiring diagram	Inside the bottom platform control box.
Electrical warning disconnection sticker	On the bottom platform control box.
UL sticker ²⁾ Electric warning disconnection sticker	Underneath the cover of the bottom platform control box.
Alignment stickers	Inside the cabin and at each landing
Lubrication sticker	On the motor cover.
No standing on top prohibition sticker ¹⁾	On the front side of the cabin.
Top clearance sticker ²⁾	On the front side of the cabin.
Maintenance brake sticker ²⁾	Inside the cabin.
Measurement of pinion and rack ²⁾	Inside the cabin.
AECO Data plate ²⁾	Inside the cabin.
Jurisdictional Code Data plate ²⁾	On the motor cover.
Pull to release sticker ²⁾	On the cabin control box.
Electrical hazard sticker	On the cabin control box.
Electrical hazard sticker ²⁾	On the weighing module box.

3.26 Internal light ¹⁾

The service lift is equipped with a light inside the cabin. When service lift is connected to power supply, this light illuminates at all times.

The internal light is battery packed in order to illuminate the inside of the cabin in case of a power failure. When fully charged, it will last at least for 30 minutes.

3.27 Warning lights ¹⁾

A set of warning lights is mounted on the top and on the bottom of the service lift. The flashes warn that the service lift is moving.

3.28 Platform fences

The platform fences protect users from falling through the service lift hole at platforms.



These platform fences shall comply with:

- EN 14122-3 for Pegasus CE bucket type version. They shall have non-slip rails or steps facilitating access to the lift and to the guiding ladder from the platforms and shall have no doors.
- EN 14122-3 for Pegasus CE full sliding door version. They shall feature a fence door monitored by a guard locking system, or a trapped key system, preventing any movement of the lift if the fence doors are not closed and locked.
- 5.11 of ASME A17.1-2012/CSA B44-13 for Pegasus AECO version. Given that call function is included, the fence doors shall be monitored by a guard locking system, or a trapped key system, preventing any movement of the lift if the fence doors are not closed and locked.

4. Instructions for use

4.1 Cautions

Aspects to consider for a good use of the service lift:

1. No person is on the ladder when the service lift is in operation.
2. The service lift is free of objects.
3. No objects are located on the top of the cabin.
4. Electrical system is properly insulated.



Ladder and rest platforms must be used only for evacuation or when the service lift is out of service.



In bucket type version: users inside the cabin shall be attached to an anchor point when door is open. In full sliding door ¹⁾ version: users inside the cabin shall be attached to an anchor point at all times.



¹⁾ Optional for CE versions. Mandatory for AECO version.

²⁾ Not applicable to CE versions. Mandatory for AECO version.



(If MANUAL/AUTO selector ¹⁾ on cabin control box is provided) After using service lift and before exiting the WTG, the MANUAL/AUTO selector of cabin control box shall be turned to the AUTO position. This way it will be possible to call the lift from top platform if necessary.

4.2 Prohibited uses



The following prohibitions shall be observed when using the service lift. The consequences of not following them are extremely hazardous to the physical integrity of the users.

It is prohibited to:

1. Use the service lift beyond its intended purpose.
2. Operate the lift without following the safety warnings and operating instructions.
3. Load the service lift more than its rated load.

4. Try to repair machine components. Only personnel from AVANTI or qualified personnel authorised by AVANTI are allowed to perform service on the service lift.

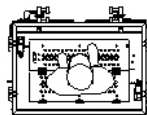
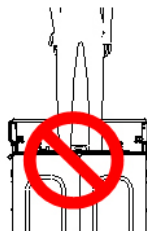
5. To travel on service lift roof.

6. To use the emergency manual release of door lift or fence doors during normal use.

7. To manipulate switches or safeties.

8. To disattach trapped key ²⁾ from wire rope.

9. To have a second trapped key ²⁾.



4.3 Operation from inside the cabin

1. Turn the ON/OFF main switch of the bottom platform control box to the ON position.
2. Open the door, climb the fence-railing and go inside the cabin and close the door.
3. Turn the ON/OFF selector of the cabin control box to the ON position.
4. To go up or down, press and hold the UP or DOWN button as needed.

4.4 Operation from bottom platform

To send ³⁾ or call the service lift from the bottom platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP ³⁾ or DOWN button.



Coordinate send ³⁾ or call actions between personnel by means of walkie-talkies.



Transportation of persons is forbidden if the operation is controlled from the platforms.



¹⁾ Not applicable to CE versions. Mandatory for AECO version.

²⁾ Optional for CE versions. Mandatory for AECO version.

³⁾ Optional for CE versions and for AECO version.

⁴⁾ Optional for CE bucket type version.

Mandatory for CE full sliding door version and for AECO version.

⁵⁾ Optional for CE versions. Not available for AECO version.

⁶⁾ Applicable to CE bucket type version.

4.5 Operation from top platform

To send ³⁾ or call the service lift from the top platform control box:

1. Check that the ready light is illuminated.
2. Check that the fault light is not illuminated.
3. Press and hold the UP or DOWN ³⁾ button.

4.6 Landing alignment

The service lift can be landed at any platform totally aligned to permit safe egress and ingress. To do so:

1. Travel to desired platform (bottom, intermediates and top one).
2. Locate the service lift so that alignment sticker of inside the cabin overlaps alignment sticker of the ladder.
- 2B. If a platform switch ⁴⁾ is provided, locate service lift so that platform light ⁴⁾ of cabin control box illuminates.
3. Exit from cabin can be done safely.

4.7 Enter and exit cabin

4.7.1 Bucket type ⁵⁾

To enter the cabin:

1. Open the door and attach the shock absorber to the cabin anchor point.
2. Climb the fence-railing holding the handles.
3. Climb down using the cabin steps.

To exit the cabin:

1. Attach the shock absorber to the cabin anchor point and open the door.
2. Climb up the cabin using the cabin steps and holding the handles.
3. Climb down the fence-railing to the platform.

4.7.2 Full sliding door ²⁾

To enter the cabin:

1. Open the door.
2. Enter the cabin.
3. Attach the shock absorber to the cabin anchor point.
4. Close the door.

To exit the cabin:

1. Open the door.
2. Exit the cabin.
3. Release the shock absorber from the cabin anchor point.
4. Close the door.

4.7.3 Top / Bottom hatch

To enter the cabin:

1. Climb the ladder attached to the fall protection system or attach the shock absorber to the tower anchor.
2. Open the hatch.
3. Attach the shock absorber to the cabin anchor point.
4. Release the fall protection device or shock absorber from the tower anchor point to enter the cabin.
5. Climb inside the cabin holding the handles ⁶⁾ and the cabin main frame ladder as support.
6. Close the hatch

To exit the cabin:

1. Attach the shock absorber to the cabin anchor point.
2. Open the hatch.
3. Climb out of the cabin using the handles ¹⁾ and the cabin main frame ladder as support.
4. Attach to the fall protection system or attach the shock absorber to a tower anchor point.
5. Release the shock absorber on the cabin anchor point.
6. Close the hatch.



WTG manufacturer must ensure that access to the top platform or nacelle can be done safely to avoid risk of falling.

4.8 Lateral windows ²⁾

To open a window:

1. Remove cabin trapped key from cabin key lock.
2. Insert window trapped key in the window key lock.
3. Turn the window trapped key clockwise.
4. Pull the window knob downwards to open the window.

To close the window:

1. Pull the window knob upwards to close the window.
2. Push and turn anticlockwise the window trapped key.
3. Release the window trapped key.
4. Insert the cabin trapped key in the cabin key lock.

4.9 Emergency stop button

Release the UP/DOWN buttons and the service lift should stop. If it does not, push the emergency stop button, and all controls should be disabled. Turn / pull the emergency stop button to reset the control.

4.10 Manual descent

In case of power failure or an operation fault, a controlled descent without power can be performed. To do so:

1. Remove the seals of the hand levers of the motor brake.
2. Check that there are no obstacles or person on the way.
3. Push upwards or downwards the two hand levers at the same time. The service lift will start travelling down.
4. To stop, simply loosen the hand lever.



A buzzer ³⁾ will sound during manual descent.



Manual descent shall only be performed if it is strictly necessary.



Always look through the perforated floor of the cabin to see if anyone is standing on the ladder.



Use walkie-talkie to report about the manual descent.

4.11 Rest platforms

If use of rest platforms is needed:

1. Climb up on the ladder to be one step above the rest platform.
2. With the safety of all your PPE, push down the rest platform with your foot.
3. Once platform is properly supported on the rung, stand over it with both feet.
4. The rest platform returns to its folded position once it is not in use.



Always wear all the PPE and attach the fall protection device to the fall protection rail system of the ladder.

User(s) in a rest platform **MUST ALWAYS BE** attached safely to the fall protection system.

4.12 Service ladder

The service lift uses a ladder as support and guide. In case of failure of the lift, this ladder is used to evacuate people (see "Appendix A: Safety measures").

5. Out of Service

1. Securing the service lift:

Bring the service lift all the way down, until the lift reaches bottom platform.

2. Turn off the main switch to prevent inadvertent operation of the lift:

Turn the main switch to the OFF position. Power supply is now interrupted. Mark the lift "OUT OF SERVICE" and padlock as necessary. Contact AVANTI or qualified personnel authorised by AVANTI.



¹⁾ Applicable to CE bucket type only.

²⁾ Optional for CE versions.

Not available for AECO version.

³⁾ Applicable to AECO version only.

6. Maintenance

A maintenance is required and necessary:

- To avoid premature wear
- To prolong the lifetime of the machine
- To maintain the level of safety which the service lift was designed and manufactured to.

6.1 Maintenance planning



Perform the inspections filling in the "Appendix B: Inspection checklist" and the "Appendix C: Operation log sheet".

Frequency	Performed by	Inspection checklist reference	Components
Daily	Supervisor	1	Travel zone
		2	Control and safety devices
		3	Cabin
Annually	Avanti or qualified personnel authorised by AVANTI	1	Travel zone
		2	Control and safety devices
		3	Cabin
		4	Guiding system
		5	Doors and hatches
		6	Electrical system
		7	Traction system
		8	Overload limiter
		9	Trapped key
		10	Guard locking
		11	Platforms
		12	Information signs and documents
		13	Final assessment

6.2 Cautions



Before any maintenance operation check that the service lift is out of service.



If any faults occur during work,
- Stop working,
- If required secure the workplace and
- Rectify the fault!



Make sure that nobody is exposed to danger below the service lift, for instance from falling parts.



Before any maintenance task, ensure that walking way surfaces are dry and not slippery.

During maintenance tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment (when falling height is more than 2 m), hand gloves, helmet, safety glasses and working gear.
- Place service lift at bottom platform and disconnect power supply.
- Use an electricity measuring tool when performing inspection of electrical components.
- Use a hand winch attachable to the ladder when handling big/ heavy loads and shall be performed at least by 2 persons.
- Panel parts shall be removed to facilitate access to confined spaces.
- Guiding rollers shall be replaced one by one.
- Use a cable grip when replacing travelling cable.
- Keep service lift doors closed when using a 3-step ladder.



Only AVANTI or qualified personnel authorised by AVANTI shall perform electrical installation tasks.

6.3 Daily inspection



Daily inspection of the service lift shall only be performed by personnel authorised by AVANTI. If there is more than one user, the employer shall appoint a supervisor in charge of the daily inspection.

6.3.1 Travel zone

1. Ensure that there are no obstacles within the service lift's travel zone which may obstruct the travel of the cabin or hit the cabin.
2. Ensure that the ladder rack is solidly and safely fixed.

6.3.2 Visual inspection

1. Check that the service lift components are mounted in accordance with the specifications and without any noticeable defects or missing components.
2. Check that the traction system (ladder rack & pinion) is not damaged or jammed.
3. Check that the guided system is not damaged or jammed.
4. Check that the two motor groups are in good conditions and not damaged.

6.3.3 Functional inspection

Check that the safeties are in place and working.

6.3.3.1 PLATFORM CONTROL BOX

1. Main switch ON/OFF: Turn the ON/OFF electric isolator on the bottom platform control box to the OFF position. The green light shall be OFF. The service lift shall not run. Turn it ON; the green light shall be ON.
2. Emergency stop button: The service lift shall not move UP/DOWN. Release the emergency stop button and drive the lift UP approximately 1 m.
3. Press UP/DOWN buttons on the control box. The lift should travel upwards or downwards.

6.3.3.2 CABIN CONTROL BOX

1. ON/OFF selector: Turn the ON/OFF selector on the cabin control box to the OFF position. The green light shall be OFF. The service lift shall not be able to run. Turn it ON; the ready light (green) shall be ON. The service lift shall be able to run.
2. Emergency stop button: Press the emergency stop button. The service lift shall not move UP/DOWN. Release the emergency stop button and drive the lift UP approximately 1m.
3. Fault light: Press the emergency stop button, the fault light (red) of the cabin control box shall be ON.
4. Top and bottom hatch: Open the hatch, the fault light (red) shall be ON and the lift shall not move UP/DOWN.
5. Service lift door: Open the door, the fault light (red) shall be ON and the lift shall not move UP/DOWN.
6. Drive the service lift DOWN until the bottom obstruction device hits the bottom mechanical stop. The lift shall stop.
7. Drive the service lift UP until the top obstruction device hits with the top mechanical stop. The lift shall stop.
8. Pull down the top hatch handle until the roof switch is activated, the fault light (red) shall be ON and the lift shall not move.

6.4 Annual inspection



Annual inspection may only be performed by AVANTI or qualified personnel authorised by AVANTI.

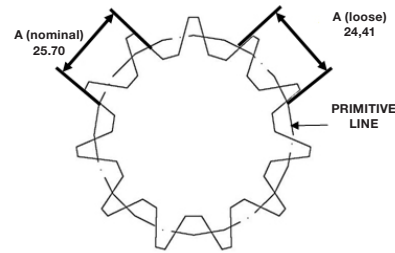
6.4.1 Pinions

Check carefully that the pinions are free from deterioration, damage or abrasion.

Wear limit:

To evaluate the wear of the pinion, "A" dimension

measured on the primitive line shall range between 24.41 and 25.7 mm.



Pinion replacement criteria is shown in table below:

DIMENSIONS	NEW PINION (mm)	CHANGE PINION (mm)
A	25.70	< 24.41

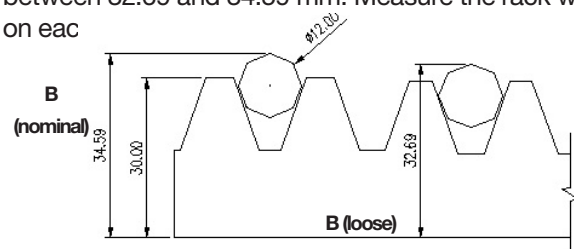
6.4.2 Ladder rack

The user has to inspect the full length of the ladder by climbing on the ladder.

1. Check carefully that the rack is free from deterioration, damage or abrasion.
2. Check that the ladder mast has no cracks, dents or damages.

6.4.2.1 Wear limit

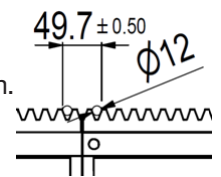
1. Using a calibrated rod of Ø 12 and check that dimension control "B", as shown in the picture, is between 32.69 and 34.59 mm. Measure the rack wear on eac



Rack replacement criteria is shown in table below:

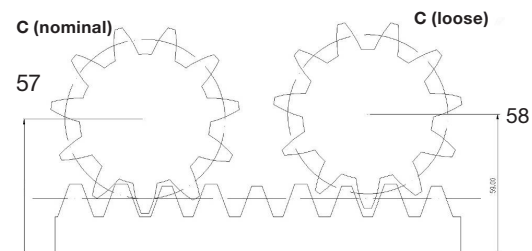
DIMENSIONS	NEW RACK (mm)	CHANGE RACK (mm)
B	34.59	< 32.69

2. Using two calibrated rods of Ø 12 mm check that distance between ladder sections dents is 49.7 ± 0.5 mm.



6.4.2.2 Looseness limit:

To evaluate the looseness, check of control dimension "C" shall be between 57 and 58 mm.



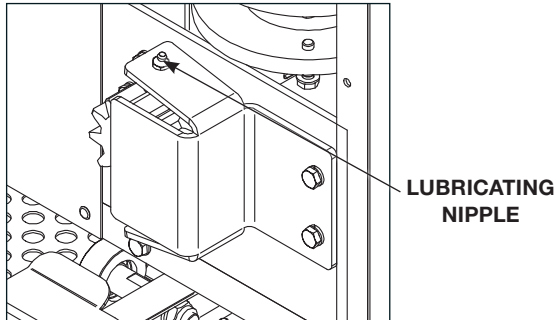
Rack replacement criteria is shown on table below:

DIMENSIONS	NEW RACK (mm)	CHANGE RACK (mm)
C	57	> 58

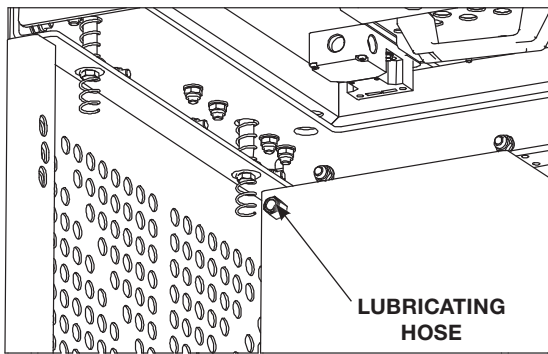
6.4.2.3 Lubricate the rack

Check status of old lubricant on rack and pinions. If maintenance required proceed as follows:

1. Place lift at bottom platform and disconnect power supply.
2. Clean old lubricant off the rack and pinions.
3. Use a grease gun and a zipper sleeve to lubricate low pinion through lubricating nipple.



4. Turn on the power supply and enter the lift.
5. Remove female adaptor from grease gun and connect gun to lubricating hose. Its location is indicated by means of a lubricating point sign.



6. Apply lubricant to top pinion from inside the cabin throughout ascent.
7. Repeat lubrication throughout descent.
8. If necessary clean excess of new lubricant off the rack.

i Clean and lubricate the rack every time you replace a section of the ladder.
If use is more severe, it will be necessary to lubricate more often.

The type of grease can be KRAFFT KGP 2M or equivalent. For low temperature use LUBEKRAFTT KMG or equivalent.

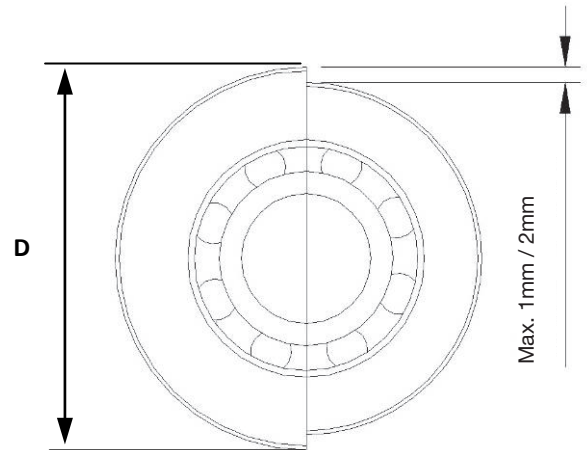
6.4.3 Guiding rollers

Check that the outer surface of the rollers is uniform and free from damage.

Wear of surface shall not be bigger than 1 mm on counter guiding rollers and 2 mm on guiding rollers. Check that control dimension "D" is between 48 and 50 mm on counter guiding rollers and between 46 and 50 mm on guiding rollers.

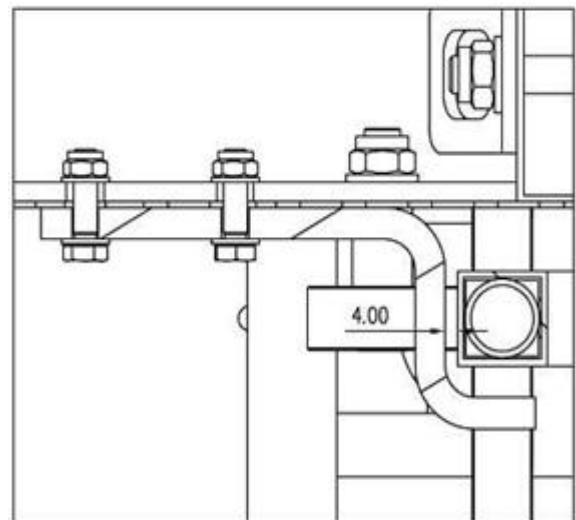
DIMENSIONS	NEW COUNTER GUIDING ROLLER (mm)	CHANGE COUNTER GUIDING ROLLER (mm)
D	50	>48

DIMENSIONS	NEW GUIDING ROLLER (mm)	CHANGE GUIDING ROLLER (mm)
D	50	>46



6.4.4 Anti-derailment bracket

Check that gap between anti-derailment bracket and ladder stile is 4 mm.



6.4.5 Torques Assurance

Check tightening torques of all screw connections with approved and calibrated torque wrench in the following cases:

1. In tower factory, during assembly of ladder section to tower section.
 2. On site, pre-commissioning, and in each annual inspection.
- See joints to be checked and appropriate tightening torques for each case in the list below:

Ladder:		TORQUE (N•m)	
		ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
JOINT	METRIC		
Rung U-bolts	12	50	50
Rest platforms attachment	12	50	50
Ladder sections	12	50	50
Ladder anchorages – Tower brackets	12	50	12
Rung fittings of safety rail	6	8	8
Ladder – Top mechanical stop	8	15	15
Ladder – Bottom mechanical stop	8	15	15

Motor group:		TORQUE (N•m)	
		ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
JOINT	METRIC		
Gear box – Centrifugal brake	8	15	15
Motor group – Main structure	8	15	15
Motor – Centrifugal brake	8	15	15

Cabin:		TORQUE (N•m)	
		ASSEMBLY IN TOWER FACTORY	ASSEMBLY ON SITE
JOINT	METRIC		
Fall protection anchor point – Cabin	12	15	15
Roller shafts – Main structure	12	50	50
Counter roller guide shafts – Main structure	12	50	50
Anti-derailment brackets	8	15	15

6.4.6 Overload, static and dynamic tests

1. Overload detection system test: check that the overload detection system works by applying a load of 125% of working load limit to the lift floor. The service lift shall not move UP and the overload light on the control box shall light up.
2. Static test: apply a load of 125% of working load limit to the lift floor. The service lift shall not show any damage or cracks.
3. Dynamic test: apply a load of 110% of working load limit to the lift floor. The service lift shall be able to move UP.



If the overload detection system fails, it must be verified by AVANTI or qualified personnel authorised by AVANTI.

6.4.7 Motor group

6.4.7.1 Gear box

1. Visually check for oil leaks. In case oil leaks are found, exchange the gasket on the gear box cover, and re-fill with oil as needed.
2. Close the cover and ensure that the correct torque is applied.

6.4.7.2 Centrifugal brake

Perform the following test to check that the centrifugal brakes are in good condition.

1. Remove the motor cover so that the motor groups are accessible from inside the lift.
2. Ascend the service lift 20 m.
3. While introducing a tachometer inside the shaft hole of the top or bottom pinion, and with cold centrifugal brakes, perform a manual descent of 20 m.
4. If the tachometer's reading is higher than 140 rpm, it means that the centrifugal brakes are too worn out.
5. In such case, replace the brake linings and hubs.



This operation shall be done only by AVANTI or qualified personnel authorised by AVANTI, and following the centrifugal brake manufacturer instructions.

6.4.7.3 Motor brake

1. Load the service lift with a load of:
 - 1.1 times the nominal load for CE versions.
 - 1.5 times the nominal load for AECO version.

Release one of the two motor brakes by pulling its hand lever. While keeping the brake open, push the UP button and stop after 0,5 m. The cabin should stop and the brake must be able to hold the cabin. Repeat this operation 3 times.

2. Repeat the operation with the other motor brake.

If any of the two motor brakes fail to stop and hold the service lift in position, proceed as follows:

3. Measure the air gap. If the air gap is greater than specified by the manufacturer and the brake disc thickness is sufficient, readjust the air gap according to the motor brake manufacturer's specifications.

Check the brake discs and the springs for irregularities or damages. If any damages or broken parts are found, replace motor brake.

6.4.8 Obstruction devices

Clean and lubricate the guiding shafts of the top and bottom obstruction devices, in order to guarantee that the obstruction devices compress and decompress properly.

6.5 Ordering spare parts

Only original parts must be used. Spare parts list is available from AVANTI upon request.

7. Troubleshooting

All tests and repairs to the electric components shall be performed by AVANTI or qualified personnel authorised by AVANTI.





The wiring diagram is placed in the traction hoist's power cabinet.





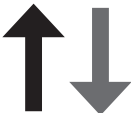
Repairs to the motor group and to the system's supporting components shall be performed by AVANTI or qualified personnel authorised by AVANTI.

If these steps do not identify the cause and rectify the fault: consult AVANTI or qualified personnel authorised by AVANTI.

Breakdown	Cause	Solution
<p>The service lift cannot ascend nor descend.</p>   <p>DANGER! Attempting to use the lift will jeopardize work safety.</p>	A1 The fixed EMERGENCY STOP button is activated.	Turn this button clockwise until it moves out to deactivate it.
	A2 Rack or pinions are damaged.	a) Check the damage. b) Evacuate the cabin.
	A3 The service lift is stuck on an obstacle.	a) Remove the obstacle. b) Test the operational safety of affected tower sections. c) Inform the supervisor.
	A4 Power failure. a) Main switch is set to OFF. b) Grid voltage is interrupted. c) Supply between grid connection and control is interrupted.	a) Turn the main switch to ON. b) Find the cause and wait for the power to return. c) Test and if necessary repair the supply cable, fuses, and/or wiring from the control box.
	A5 Two phases are changed in the supply.	Have AVANTI or qualified personnel authorised by AVANTI switch the two phases in the plug.
	A6 The hatches or door switches are triggered.	Check that door and hatches are properly closed.
	A7 Motor thermal protection.	a) Rearm. b) If repeated, contact AVANTI.
	A8 ELECTROMAGNETIC BRAKES do not open.	a) Check voltage to the electromagnetic brakes. b) Check the springs. c) Check the brake disc. d) Regulate the brake disc.
	A9 MAGNETIC THERMAL CONTROL.	a) Rearm. b) If repeated, contact AVANTI.
	A10 CONTROL DIFFERENTIAL.	a) Rearm. b) If repeated, contact AVANTI.
	A11 OVER VOLTAGE PROTECTION.	a) Rearm. b) If repeated, contact AVANTI.
	A12 EMERGENCY TOP AND BOTTOM LIMIT SWITCH is activated.	a) At top platform, perform manual descent until the switch is released. b) At bottom platform, disassemble the bottom plate safe zone until the switch is released. c) Check the position of the safe zone plates. d) Check the top and bottom mechanical stop position.
	A13 OVERLOAD (overload light illuminates).	a) Test and if possible reduce the load, until overload lights stops illuminating. b) If repeated, contact AVANTI.
	A14 (If trapped key system ¹⁾ is provided) the trapped key is not present or the trapped key switch is in the OFF position.	Insert the key and turn it to the ON position.
	A15 (If guard locking system ¹⁾ of fences is provided) the guard locking switch is defective.	Test / repair defective components.



¹⁾ Guard locking or trapped key systems are mandatory for CE full sliding door version. Not necessary for CE bucket type version. Mandatory for AECO version if send or call function is provided.

Breakdown	Cause	Solution
<p>The service lift can descend but cannot ascend.</p> 	B1 The service lift is stuck under an obstacle.	a) Carefully move the service lift downwards and remove the obstacle. b) Test the operational safety of the affected platform components. c) Inform the supervisor.
	B2 TOP OBSTRUCTION DEVICE is activated.	a) Check the springs. b) Move the lift down until the top obstruction switches are released.
	B3 INDUCTIVE SENSOR is activated.	a) Check section ladders. b) Check the status LED.
	B4 (If provided) Top limit switch ¹⁾ is activated. a) Top limit switch ¹⁾ is defective or not connected. b) Top limit switch ¹⁾ is activated.	a) Test the top limit switch ¹⁾ connection / function. Replace if necessary. b) Descend the service lift until the top limit switch ¹⁾ is released.
<p>The service lift can ascend but cannot descend.</p> 	C1 (If provided) Bottom limit switch ²⁾ is: a) defective. b) activated.	a) Test the bottom limit switch ²⁾ connection / function. Replace if necessary. b) Ascend service lift until bottom limit switch ²⁾ is released.
	C2 Bottom obstruction switches are: a) defective. b) activated.	a) Test the bottom obstruction switches connection / function. Replace if necessary. b) Ascend service lift until bottom obstruction switches are released.
	C3 The service lift is stuck on an obstacle.	a) Carefully move the service lift upwards and remove the obstacle. b) Test the operational safety of the affected platform components. c) Inform the supervisor.
 <p>The service lift can ascend and descend but motor hums loudly.</p>	D1 Motor is damaged.	Contact AVANTI.

8. Transport

The transport conditions shall be agreed with customer. If special transport requirements are needed, customer must specify them to AVANTI prior to delivery. The following conditions shall be considered.

8.1 Cabin

- Land transport: rear support over pallet, non-stackable. Dimensions: 3000 x 800 x 1200 mm.
- Sea transport: package using wooden box and plastic shrink on a pallet. Dimensions: 3000 x 800 x 1200 mm.

8.2 Installation accessories

The installation accessories other than mast sections (rest platforms, power cable, etc.) are supplied on a European pallet.

8.3 Mast sections

Mast sections are supplied on a pallet. Dimensions: 1500 x 800 x 1000 mm.

9. Delivery inspection

Check the delivery against shipping lists and look for transport damages. Should there be any damage, report it to the responsible transport insurance company within 24 hours from the date of arrival of the goods.

Other claims should be made to AVANTI representative within the same period.

10. Storage

The storage conditions shall be agreed with customer. If special storage requirements are needed, customer shall specify them to AVANTI prior to delivery. The following conditions shall be considered.

10.1 Before installation of service lift on WTG tower section

Keep the service lift in its original packaging until it is mounted on the WTG tower section.

Avoid direct contact of package with floor by placing a pallet under it. Position the pallet on a stable ground. Store the service lift in a dry place and protected from rain (i.e. in roofed areas). In corrosive environments (i.e. near the sea or in foggy places) store indoors.

Store in a clean and ventilated place, free of negative influences of chemical and water vapours or other corrosive substances.

Store between -30°C and 80°C (survival temperature). If possible, avoid sudden temperature changes.

Handle the service lift with care and store in a safe place in order to avoid unintended damages.

Do not stack.

Should any of these conditions not be maintained, the service lift could be spoilt with dirt or other substances, which could start corrosion before even the service lift is put into operation.

Store the package so that its labelling is clearly readable.

10.2 After installation of service lift on WTG tower section

After installing the service lift in the WTG tower section, confirm that the service lift is properly attached to the ladder (i.e. pinions are engaged with rack, and rollers and anti-derailment brackets are mounted).

Close top and bottom holes of WTG tower sections with covers to prevent water entry.

10.3 During WTG tower erection

During the erection of the WTG tower sections, and while there is risk of rain entry, protect the service lift with wrapping film to prevent water entry.

If WTG tower erection is left uncompleted, close the top hole of the WTG tower section with a cover.

In case that the inside of the WTG tower sections is washed, protect the service lift with wrapping film to prevent water entry.

10.4 After service lift is put into service

If the service lift is not going to be used for a long period of time:

- Clean all the parts of the service lift using non-abrasive brushes.
- Clean the pinions and racks thoroughly and grease them to prevent corrosion.

Before using the service lift, if it has not been used for a long period of time:

- Clean all the parts of the service lift of accumulated dust.
- Grease the shafts, pinions and rack.

11. Installation

11.1 WTG requirements

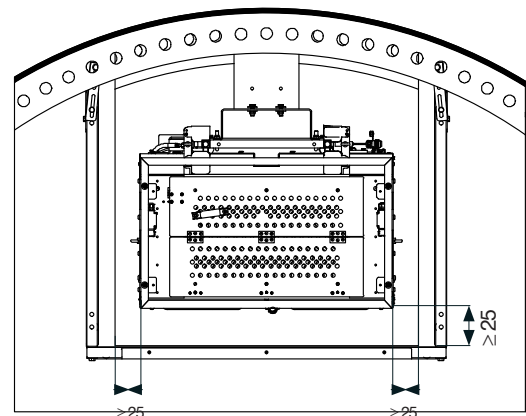
The following information is necessary for the correct integration of the service lift inside a wind turbine tower.

11.1.1 Height and angle

The service lift can be installed on towers up to 150 m high, and with a maximum inclination angle to the ladder axis of $\pm 2^{\circ}$ and of $\pm 0,5^{\circ}$ for every 3 m of ladder.

11.1.2 Lift holes at platforms and air gap to tower parts

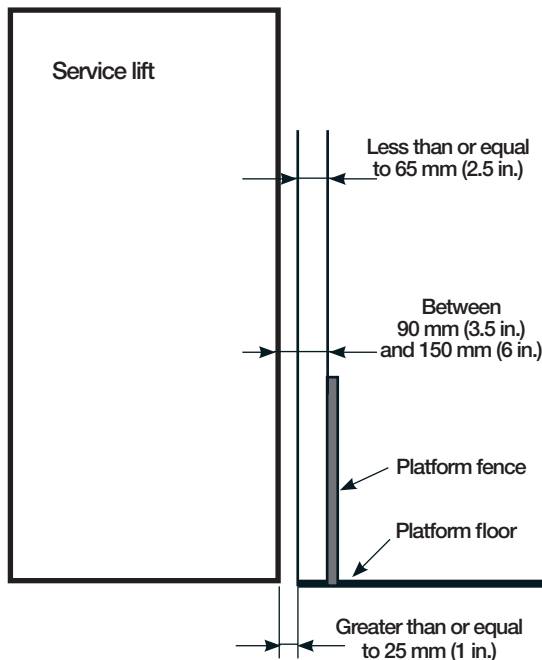
The service lift must have an air gap of at least 25 mm around it along the tower to avoid collision with tower components and to avoid finger trapping. The wind tower manufacturer must verify this as part of the integration process not only in the static position but also considering possible movement of components inside the tower as a consequence of the tower sway.



¹⁾ Optional for CE versions. Mandatory for AECO version.

²⁾ Not available for CE versions. Optional for AECO version.

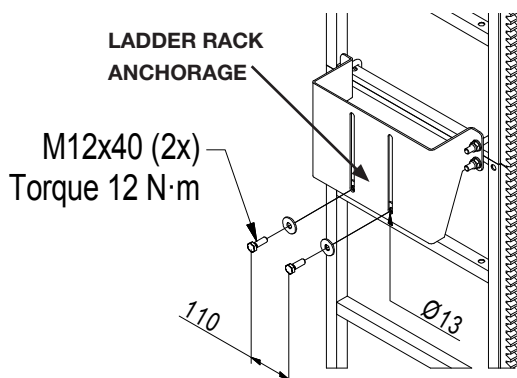
The gaps on the loading side of the service lift shall conform to applicable requirements of 5.11 of ASME A17.1-2013/CSA B44-13 ¹⁾.



The components subjected to possible movement inside the tower may include, but are not limited to, dampers, cables, doors, hatches, etc. The service lift needs a gap of 500mm below the lowest landing area to accommodate the bottom buffers.

11.1.3 Tower support brackets

The ladder rack is attached to the tower structure at a distance of max 3000 mm. The tower support brackets must be so designed that the ladder rack anchorages can be mounted. The connection between the tower support brackets and the ladder rack anchorages is done with M12 bolts A2-70 tighten with a torque of 50 N·m in the tower factory but with a torque of 12 N·m on site once the tower has been erected and before the cabin is going up. Reaction forces on connection bolts must be considered in the design of the tower brackets. This information may vary with the installation characteristics. Contact AVANTI to get the information.



11.1.4 WTG electrical supply requirements

Electrical supply requirements		
Version	CE	AECO
Power Supply Type	3 Phase +PE + N	3 Phase + PE
Voltage	400 V \pm 5 %	400 V \pm 5 %
Frequency	50 / 60 Hz	60 Hz
Fuses	16 A	16 A
Protection	Acc. To EN 60204 - 1	UL 508A

11.1.5 Other requirements

The WTG manufacturer must provide any other means necessary to ensure the safe use of the service lift according to AVANTI recommendations and its own risk assessment for the integration that shall include items which are not under AVANTI's scope.

11.2 Cautions on site

All installation process must be made according to the installation drawing supplied by AVANTI.



Prior to installation, check the instructions and drawings.



Prior to installation, ensure that building sections involved will be able to withstand the service lift loads.



Prior to installation, ensure that all necessary parts and tools are available and fully functional.



Prior to installation, ensure that platform holes are protected with fences.



Wear PPE for protection against falls if falling height is higher than 2 m.



Installation shall be performed by AVANTI or qualified personnel authorised by AVANTI.



The customer must define the maximum allowable wind speed ensuring safe installation.



At the end of the workday security measures must be taken to put the elevator out of service and make the ladder accessible. Place a warning sign: SERVICE LIFT OUT OF SERVICE. DO NOT USE



¹⁾ Optional for CE versions. Mandatory for AECO version.

11.3 Assembly in tower factory

11.3.1 Top tower section

1. Install and adjust upper ladder section at the top of the top tower section (see Fig. 1 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.

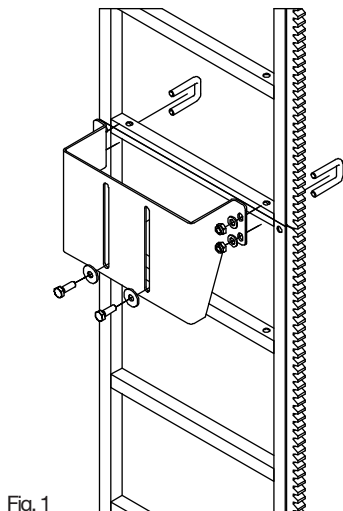


Fig. 1

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

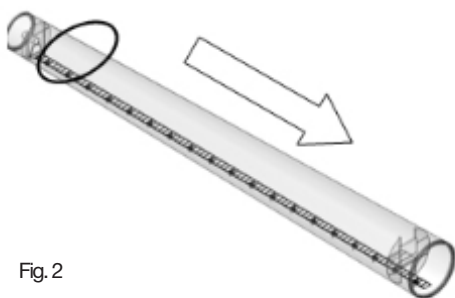


Fig. 2

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).



Fig. 3

4. Install the top mechanical stops and the top limit plate (see Fig. 4 and installation drawing). Use 15 N·m torque for M8 and 50 N·m for M12.



Fig. 4

11.3.2 Intermediate tower sections

1. Install and adjust upper ladder section at the top of the intermediate tower section (see Fig. 1 and installation drawing).

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).

3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).

4. Install the electric cable arm support (see Fig. 5 and installation drawing).

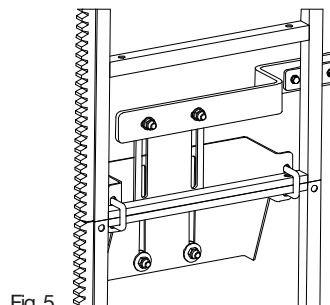


Fig. 5

5. (If platform switch ¹⁾ on service lift is provided) install a safe zone plate on the ladder at each platform.

11.3.3 Bottom tower section

1. Install and adjust upper ladder section at the top of the bottom tower section (see Fig. 1 and installation drawing).



¹⁾ Optional for CE bucket type version.
Mandatory for CE full sliding door version.
Optional for AECO version.

2. Install the rest of the ladder sections from top to bottom (see Fig. 2).
3. Install the rest platforms approximately every 9 m (see Fig. 3 and installation drawing).
4. Position the cabin inside the bottom tower section ensuring that bottom guiding rollers are aligned with a ladder support (see Fig. 6).

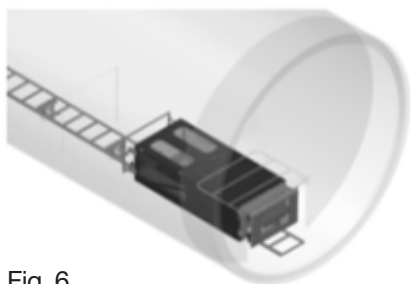


Fig. 6



Mount the guiding rollers shafts into the correct holes: green shafts into green coloured holes and orange shafts into orange coloured holes.

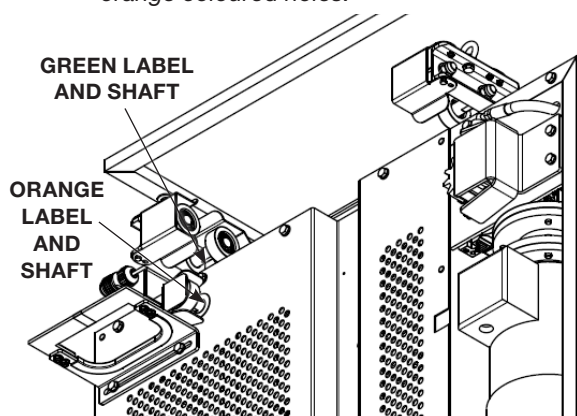


Fig. 7

5. Install the bottom mechanical stop and the bottom limit plate (see Fig. 8 and installation drawing).

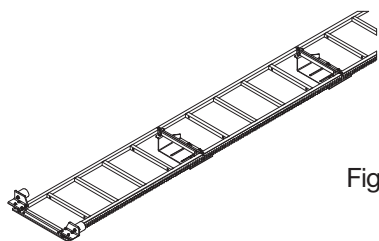


Fig. 8



It is also possible to install the cabin and bottom mechanical stop on site.



Service lift can be used during installation.

11.4 Assembly on site

After the tower sections are erected:

1. Climb up to the second tower flange.
2. While descending to the previous tower flange, loosen connection bolts between the ladder rack anchorages from the tower support brackets.
3. Lower down the loose ladder section until it contacts the previous ladder section, so that no gap exists.
4. Tighten the connection bolts between the ladder sections (see Fig. 9).



Fig. 9

5. Using two calibrated rods of $\varnothing 12$ mm check that distance between ladder sections dents is 49.7 ± 0.5 mm.

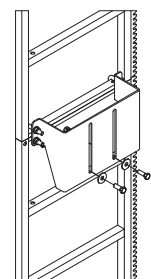


Fig. 10

7. Climb up to next tower flange and repeat actions 2 to 5 until there are no gaps between the ladder sections.

8. Check that gap between anti-derailment bracket and ladder stile is 4 mm.

9. With the service lift at bottom platform:

- 9.1. For bucket type ¹⁾: adjust the bottom mechanical stop so that it is possible to open the double door just above the fence railing. The service lift must stop when obstruction device reaches the bottom mechanical stop (see Fig. 11).

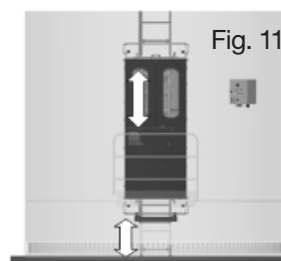


Fig. 11

- 9.2. For full sliding door without bottom limit switch configuration ²⁾: adjust bottom mechanical stop so that cabin floor is lined up with platform floor.

- 9.3 For full sliding door with bottom limit switch configuration ³⁾: adjust bottom limit plate so that cabin floor is aligned with platform floor.



¹⁾ Applicable to CE bucket type version.

²⁾ Applicable to CE full sliding door version.
Optional for AECO version.

³⁾ Optional for AECO version.

11.5 Electrical connections on site



Electrical connections must be made in accordance with EN 60204-1 for CE versions and in accordance with UL 508A for AECO version.

1. Install the top and bottom platform control boxes and connect the cable connections and the electrical boxes.

2. Use cable strips to attach the fixed cable to the tower internal (see Fig. 12).

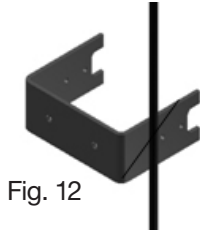
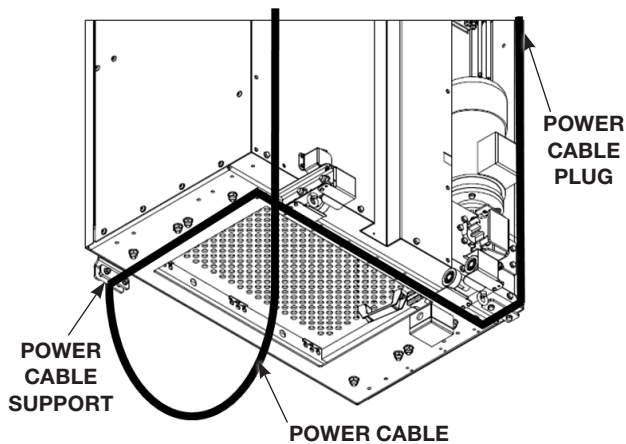


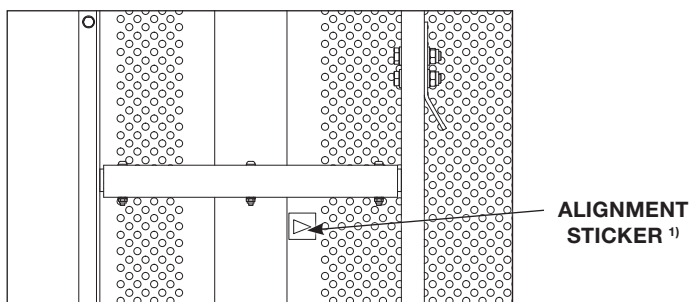
Fig. 12

3. Connect power supply cable.



11.6 Alignment stickers ¹⁾ installation

1. Stick the alignment sticker ¹⁾ inside the cabin next to the grid of holes at a height of 1,5 m from cabin floor.



2. There is an alignment sticker ¹⁾ for each tower platform. Stick the sticker ¹⁾ on right ladder stile at a height of 1,5 m from each platform, and with triangle pointing to the left.

3. For top platform, and for ring shape platforms, stick the sticker ¹⁾ on right ladder stile at 0,9 m under each platform, and with triangle pointing to the left.

12. Disassembling

In accordance with local authority regulations disassemble in reverse order and dispose.



¹⁾ Mandatory for CE bucket type version. Not available for CE full sliding door version. Optional for AECO version.

Appendix A: Safety measures

In general: Only use service lift if you have received instructions about how to operate the Service Lift in all predictable situations. These instructions can only be given by a person with the proper knowledge e.g AVANTI Trainer or Trainer approved by AVANTI. The following precautions and procedures are to be followed during operation of Service Lift, and if the Service Lift stops and the manual descent cannot be performed.

Operating the Service Lift and the ladder:

Wear PPE at all times (Safety helmet, full body harness, Shock absorber, lanyard, gloves, safety shoes and slider compatible with the safety rail).

- ! All users of the Avanti Pegasus are required to carry temporary lighting of 200 lx (flashlight, headlamp, etc.) on their person when using the Wind Turbine Elevator.
- ! User(s) in a rest platform **MUST ALWAYS BE** attached safely with fall protection device.

EVACUATION of personnel from the service lift is only necessary in extreme situations. In this case AVANTI recommends the following procedures:

Evacuation through BOTTOM hatch:

1. Attach shock absorber to the bottom yellow anchor point. Position yourself to one side of the bottom cabin hatch, in the same side as the bottom anchor point (see Fig. 1).
2. Pull up the bottom cabin hatch and push down the bottom obstruction hatch (see Fig. 2).
3. Climb down through the bottom hatches (see Fig. 3).
4. Attach the fall protection device to the fall protection system on the ladder.
5. Release the shock absorber from the service lift.



Fig.1

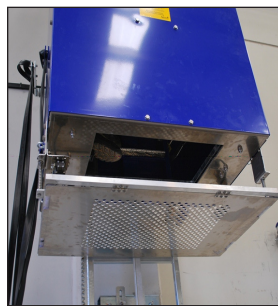


Fig.2



Fig.3



Fig.4



Fig.5

Evacuation through TOP hatch:

1. Attach shock absorber to the top yellow anchor point. Position yourself to one side of the bottom hatch, in the same side as the top anchor (see Fig. 6).
2. Push up the top hatch and attach the shock absorber to the ladder (see Fig. 7).
3. Climb up through the top hatch (see Fig. 8).
4. Attach the fall protection device to the fall protection system on the ladder (see Fig. 9).
5. Release the shock absorber from the service lift and from the ladder (see Fig. 10).



Fig.6



Fig.7



Fig.8



Fig.9



Fig.10

Lift rescue procedure:

How to act in case the person travelling in the cabin becomes unconscious.

1. There is a user outside the service lift.
2. Climb up or down to the nearest control box.
3. Call the lift.

For AECO version: 4. If call button does not respond, press the rescue button to enable the controls of bottom platform control box.



Images on this page reflect Pegasus CE bucket type version. However, instructions are equally applicable to Pegasus CE full sliding door version and Pegasus AECO version.

Appendix B: Inspection checklist

Date:	<input type="text"/>	Serial n° traction system:	<input type="text"/>
Name of competent:	<input type="text"/>	Serial n° traction system 2:	<input type="text"/>
Lift n°:	<input type="text"/>	Tower n°:	<input type="text"/>
Total hours of operation:	<input type="text"/>	Address of installation:	<input type="text"/>
Serial n° ladder rack:	<input type="text"/>		

1	TRAVEL ZONE	OK	Not OK	ISSUE DESCRIPTION
1.1	Is the travel zone clear of obstacles?			
2	CONTROL & SAFETY DEVICES	OK	Not OK	ISSUE DESCRIPTION
2.1	Is the cabin control box without dents, cracks and disparities?			
2.2	Do the cabin control box buttons function properly?			
2.3	Does the ready lamp (green) function properly?			
2.4	Do the UP/DOWN lights (green) light up when lift ascends/descends respectively?			
2.5	Do all emergency stop buttons interrupt lift control when activated?			
2.6	Do the bottom obstruction switches interrupt descent when activated?			
2.7	Do the top obstruction switches interrupt ascent when activated?			
2.8	(If provided) Does the top floating frame switch sit and function properly?			
2.9	Does the bottom cabin hatch switch sit and function properly?			
2.10	Does the bottom obstruction hatch switch sit and function properly?			
2.11	Does the top hatch switch sit and function properly?			
2.12	(If provided) Does the bottom limit switch sit and function properly?			
2.13	(If provided) Does the top limit switch sit and function properly?			
2.14	Does the emergency top and bottom limit switch function properly? Is it properly adjusted at top and bottom platforms?			
2.15	Does the fault light (red) light up when a safety switch is triggered? (Verify with all the switches.)			
2.16	Does the fault light (red) light up when an emergency stop button is triggered?			
2.17	(If provided) Does the platform light (green) light up when the service lift is at a platform?			
2.18	(If provided) Does the platform switch (S18) sit and function properly?			
2.19	(If provided) Does the door switch sit and function properly?			
2.20	(If provided) Does the door guard locking switch (S19.3) sit and function properly?			
2.21	Are the anti-derailment brackets properly installed and tightened?			
3	CABIN	OK	Not OK	ISSUE DESCRIPTION
3.1	Is the cabin free of cracks, dents and disparities?			
3.2	Is the cabin clean and in overall good condition?			
3.3	Are all the assembling screws of the cabin properly mounted and tightened?			
3.4	Does the bottom obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated?			
3.5	Does the top obstruction device compress when pushed and decompress when released? Are its guiding shafts clean and lubricated?			
3.6	Are the anchor points free of cracks and dents? Do they have no permanent deformation? Are the bolts properly tightened?			
3.7	Are the steps and handles properly placed and tightened?			
4	GUIDING SYSTEM	OK	Not OK	ISSUE DESCRIPTION
4.1	Is the outer surface of the guiding rollers uniform and free of damage?			
4.2	Is the wear of the surface of the guiding rollers less than 2 mm?			
4.3	Is the wear of the surface of the counter guiding rollers less than 1 mm?			
4.4	Are the guiding rollers properly installed?			
4.5	Is the guiding ladder free of damage and properly installed?			
4.6	Are the connecting screws between the ladder sections properly tightened?			

4.7	Are the connecting screws between the ladder sections and the ladder rack anchorages properly tightened?			
4.8	Is the rack of each ladder section free of damages and within allowed wear limits?			
4.9	Is the rack properly lubricated?			
4.10	Are the connecting screws between the ladder rack anchorage and the tower support brackets properly tightened?			
5	DOORS AND HATCHES	OK	Not OK	ISSUE DESCRIPTION
5.1	Do the bottom and top hatches open and close properly?			
5.2	Is the door properly mounted and tightened to the cabin?			
5.3	Does the door open and close smoothly?			
6	ELECTRICAL SYSTEM	OK	Not OK	ISSUE DESCRIPTION
6.1	Are all electrical cables free of squeeze marks? Are their isolations present and free of damages?			
6.2	Are the electrical cables laid and fixed with cable ties ensuring that there is no slack?			
6.3	Is the sealing of the control boxes in order?			
6.4	(If provided) Is the travelling cable free of squeeze marks? Is the isolation of the cables present and free of damages?			
6.5	(If provided) Is the power cable free of squeeze marks? Is the isolation of the cable present and free of damages?			
6.6	Are all the electrical plugs correctly mounted and connected? Are the plugs free of dents, cracks, disparities and loose screws?			
6.7	(If provided) Is the mid tower electrical cable support properly installed and tightened?			
6.8	Is the bottom platform control box free of damages?			
6.9	Is the mid tower junction box free of damages?			
6.10	Is the top platform control box free of damages?			
7	TRACTION SYSTEM	OK	Not OK	ISSUE DESCRIPTION
7.1	Are the 4 fixing bolts, the washers and the nuts present? Are they tightened so that there are at least 2 threads of the bolt sticking out past the nut?			
7.2	Is there no trace of oil leak around motor and gearbox?			
7.3	Are the motor groups free of damages?			
7.4	Are the motor groups properly installed and tightened to the main structure?			
7.5	Does the manual descent system function when activated?			
7.6	Do the motors sound normal during travel?			
7.7	Are the motor brakes able to stop the service lift?			
7.8	Are the pinions free of damages and within allowed wear limit?			
7.9	Are the centrifugal brakes in good condition? In other words, does any of the pinions rotate at less than 140 rpm during manual descent?			
8	OVERLOAD LIMITER	OK	Not OK	ISSUE DESCRIPTION
8.1	Have the overload, static and dynamic tests been performed successfully?			
8.2	Does the overload light (yellow) light up when the service lift is overloaded?			
9	TRAPPED KEY SYSTEM	OK	Not OK	ISSUE DESCRIPTION
9.1	(If provided) Is the trapped key properly secured to the cabin with a chain or wire rope?			
9.2	(If provided) Is the trapped key lock properly tightened to the platform fence? Is it fully functional?			
9.3	(If provided) Is the trapped key switch of the service lift fully functional?			
10	GUARD LOCKING SYSTEM OF PLATFORM FENCE DOOR	OK	Not OK	ISSUE DESCRIPTION
10.1	(If provided) Is the interlock control box properly tightened? Does it function properly (including main disconnect switch)?			
10.2	(If provided) Is the interlock detection switch of platform fence properly adjusted and tightened?			

11 PLATFORMS		OK	Not OK	ISSUE DESCRIPTION
11.1	Does the service lift pass freely through all platform openings without hitting the WTG flanges, platform floors and platform fences?			
11.2	Do platform fences fulfil specifications for proper mounting?			
11.3	Are bolts of platform fences properly tightened so that there are at least 2 threads of the bolt sticking out past the nut?			
11.4	Are the call controls of top and bottom platform control boxes fully functional?			
11.5	(If provided) Are the send controls of top and bottom platform control boxes fully functional?			
11.6	Are the bottom and top mechanical stops properly installed and tightened?			
11.7	Are the bottom and top limit plates properly installed and tightened?			
11.8	(If provided) Are the safe zone plates properly installed and tightened?			
12 INFORMATION SIGNS AND DOCUMENTS		OK	Not OK	ISSUE DESCRIPTION
12.1	Are all the information signs and documents present and legible? (For example: Max. load and PPE stickers.)			
12.2	(If provided) Are the alignment stickers present on each platform and inside the cabin? Are they installed so that lift stops aligned to each of the platforms?			
13 FINAL ASSESSMENT		OK	Not OK	ISSUE DESCRIPTION
13.1	Is the service lift installation in overall good operational condition?			Name of competent(s) in capital letters: Signature of competent(s): <div style="border: 1px solid black; height: 100px; width: 100%;"></div>



Competent inspection may only be performed by AVANTI or qualified personnel authorised by AVANTI.



Every 12 months competent inspection has to be carried out, and the “Appendix B: Inspection checklist” and the “Appendix C: Operation log sheet” must be completed for possible future reference.

Appendix C: Operation log sheet

[illegible]

Appendix D: AVANTI lift anchor

D.1 Caution

AVANTI LIFT ANCHOR is an anchor point used for protection against falls from heights intended for use with a full body harness approved according to EN 361 or Z359.1:2007 as applicable. Connection to the LIFT ANCHOR is only allowed by using self-closing connectors according to EN 362 or Z359.1:2007 as applicable.

Use in connection with other equipment than specified, may be potentially dangerous. User shall be equipped with a means of limiting the maximum dynamic forces exerted on the user during the arrest of a fall to a maximum of 6kN. In case of doubt, please contact AVANTI.

The maximum load that can be transmitted in service from the anchor device to the structure is 22.2 kN in $\pm 15^\circ$ vertical direction. The maximum deflection of the anchor point that can occur in service is 10mm.

AVANTI LIFT ANCHOR is tested and approved only to be mounted on AVANTI lifts. This manual always needs to be represented in language of sale and provided for use by all technicians. Activities at height are dangerous and may lead to severe injury or even death.

Gaining an adequate apprenticeship in appropriate techniques and methods of protection is important and is your own responsibility.

Users are obliged to read and understand this User Manual. Further they need to be properly equipped and instructed with the use of the necessary fall arrest equipment and emergency procedures in case of injury or sudden illness.

Users going to install AVANTI LIFT ANCHOR need to be familiar with the installation section of this manual. It's essential to the safety, that the user always attach the energy absorber as high as possible above his/her position, to minimize the fall distance most possible in case of a fall.

The position of the anchor point is crucial for fall arrest – the height of the fall, elongation of lanyard and energy absorber or pendulum movement of the user should be considered in order to minimize the risk of impact in obstacles in case of a fall. It's prohibited for the user to do many modifications or use non original Avanti components when assembling AVANTI LIFT ANCHOR.

Re-use of demounted AVANTI LIFT ANCHORS or parts is not allowed. Any changes or other uses beyond this manual are strictly forbidden.

Any changes or other uses beyond this manual are strictly forbidden. This documentation must be kept in the service lift for the purpose of subsequent examinations of the anchor device.

D.2 Danger

The AVANTI LIFT ANCHOR is for the use of one person only. It is strictly forbidden to carry out work if the person is in unfit mental or physical condition. Climbing and working under the influence of alcohol, drugs or any medication which can interfere with the safety are also much prohibited.

If there are any doubts to the safety of the AVANTI LIFT ANCHOR, or it isn't properly fixed, deformed or damaged with cracks or similar incompatible harms it may never be used – Please contact the manufacturer immediately. In case of corrosion the anchor immediately needs to be removed.

Observations:

Only to be used by instructed workers! Instructed workers must be aware, instructed and prepared to utilize site rescue plans.

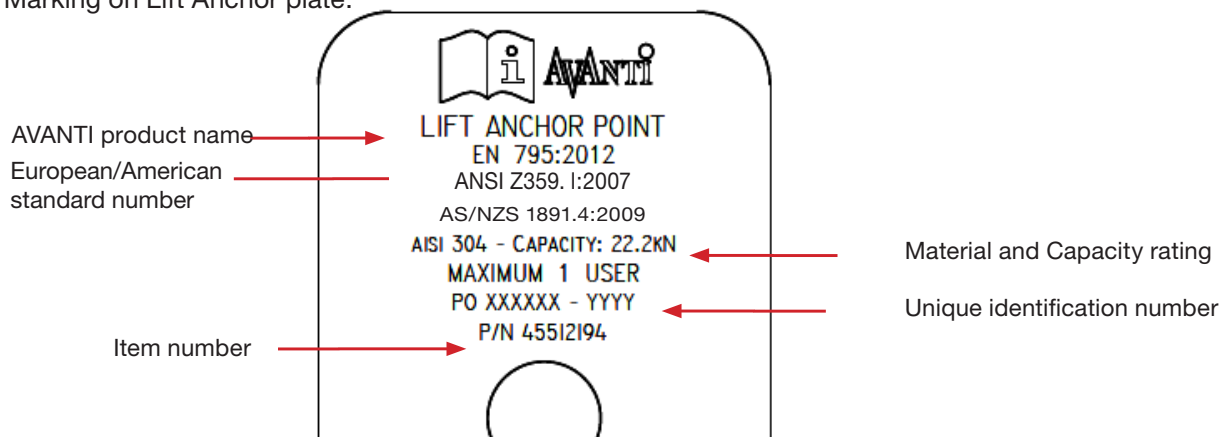
Only to be used for preventing vertical fall!

Only to be used for fall arrest, not to hoist or hang in goods or similar! Before attaching in the ANCHOR the user needs to check it is sitting fixed and screws are sitting tight and proper.

If AVANTI LIFT ANCHOR has arrested a fall it may never be used again. Part must be removed from service immediately.

D.3 Marking

Marking on Lift Anchor plate:



After installation, marking shall be completely accessible; otherwise additional marking near the anchor device will be necessary.

D.4 Installation

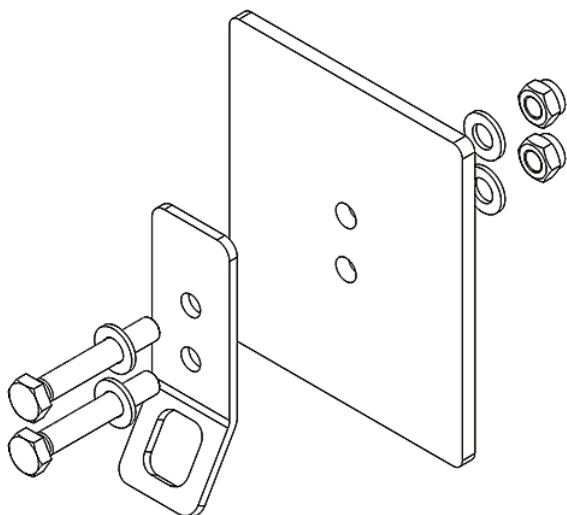
The installation must be performed by a competent person following the instructions of this manual.

AVANTI LIFT ANCHOR is tested and approved only to be installed on AVANTI lift. AVANTI LIFT ANCHOR made from AISI 304 Steel has to be screwed with two bolts DIN 933 A2-70 M12 mm, 4 washers DIN 125A A4 and self locking nuts DIN 985 A4 M12. In case of doubt, please contact AVANTI.

Before installing the AVANTI LIFT ANCHOR in heights, assure to be proper secured against fall from height by using relevant fall arrest equipment.

AVANTI LIFT ANCHOR:

1. Fix the anchor point to the structure using the supplied hardware as shown in the picture below.
2. Torque the nuts with 15 N·m (11 lb·ft).
3. Make sure the Anchor is fully seated and properly tightened.
4. Fill in "Installation form".
5. Carry out yearly inspection by following the procedure in the section "Inspection".



D.5 Inspection

After installation:

An inspection must be carried out by a competent person following the inspection form in this manual.

Before use:

Each time using the AVANTI LIFT ANCHOR the user inspects the ANCHOR visual and manually by twisting / pulling. Check the parts are properly fixed and free of deformities, damages, cracks or similar unacceptable defects.

Periodical examination:

A periodic examination at least every 12 month is essential for the safety of the AVANTI LIFT ANCHOR. The examination must be performed by a competent person following the inspection form in this manual.

For the AVANTI LIFT ANCHOR the competent person (authorized in writing by AVANTI) only needs to be trained in any metallic component covered by the European/American standard norms for fall arrest equipment.

D.6 Inspection form

PPE Anchor:	Manufacturer:	Avanti
	Type / Model:	Lift Anchor
	Identification no.:	
Fixing structure:	Lift serial no.:	
	Lift model:	
	Wind farm / WTG no.:	
Installed by:		
Installation company:		

	OK	not OK
1. Lift structure does not show any deterioration.		
2. Anchor locking screws are fully inserted and tightened with 15 N·m.		
3. Anchor does not show cracks, deformities, corrosion or other damages.		
4. Anchor installed on the lift structure according to the instructions.		
5. Anchor marking is clearly readable.		

Is the Anchor in good condition to be used?

Yes Needs Repair Replace

--	--	--

Signature of competent:

Name of competent in capital letters:

Date:

If the AVANTI LIFT ANCHOR is found not OK, it must be removed / replaced by a new AVANTI LIFT ANCHOR! The result of the periodic examination must be recorded in the Registration form of anchor.

D.7 Registration form of anchor

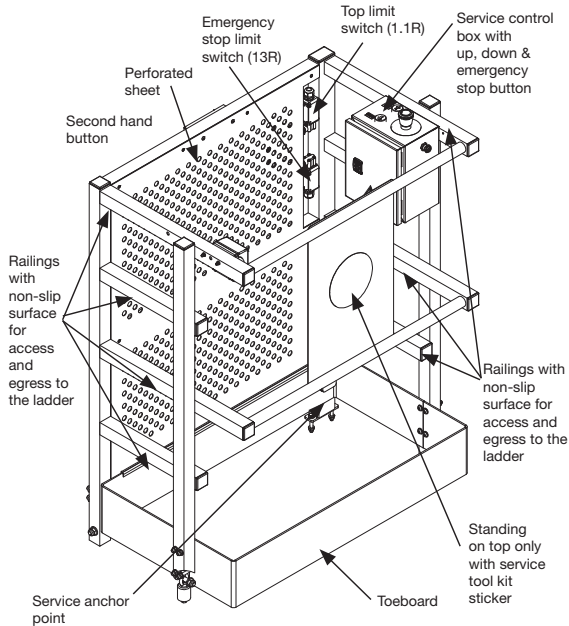
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Appendix E: Service tool kit ¹⁾

E.1 Description

The service tool kit is an optional portable tool that allows a user to ride on top of the service lift in order to perform installation and service tasks along the travel zone:

- During erection of WTG: installing WTG power supply and auxiliary cables running close to the lift.
- Maintenance: tightening and verifying torque of WTG flange bolts.
- Repair: replacing components which are accessible from the lift: lights, junction boxes and cables.



1. When STK is mounted on lift:
 - the top obstruction device (roof) is compressed and therefore activated; consequently control is interrupted.
2. When STK is mounted on lift and service control box is connected:
 - the controls of cabin control box and platform control boxes are overridden, but
 - the controls of service control box are still not operational.
3. When STK is mounted on lift, service control box is connected, NORMAL/SERVICE selector of cabin control box is turned to SERVICE position, and MANUAL/AUTO selector ²⁾ is turned to AUTO position:
 - the controls of cabin control box and platform control boxes are overridden,
 - the controls of service control box are operational, and
 - the rated load inside the cabin is decreased from 240 kg to 30 kg. This way it is not possible to travel inside the cabin when STK is installed.

The connection of the service control box does not override any safety: if any hatch, door or limit switch, or emergency stop button, is activated, no travel will be possible. There are three controls available on the service control box: UP and DOWN buttons and an emergency stop button. Horizontal railings have non-slip surface.

E.2 Technical specifications

Service tool kit	
Service tool kit weight	<25 kg
Rated load inside the cabin when service tool kit installed	30 kg
Max. n° persons inside the cabin	0 person
Max. n° persons on service tool kit	1 person
Free working space (W x D)	583 x 500 mm
Height of guardrail	1100 mm

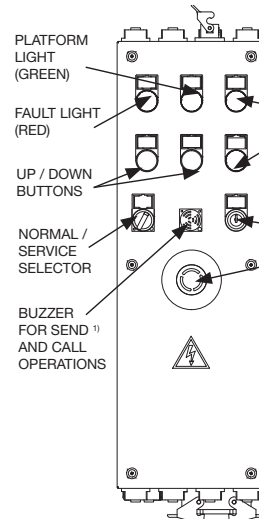
E.3 Dimensions

Space inside the service tool kit is limited to one user only.

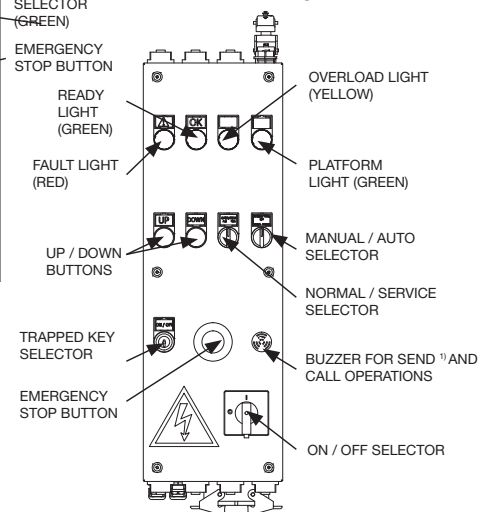
E.4 Cabin control box

When service tool kit is supplied, the cabin control box features a NORMAL/SERVICE selector.

CE cabin control box with service tool kit configuration:



AECO cabin control box with service tool kit configuration:



E.5 Cautions



- Only one user on service tool kit is allowed.
- During service tool kit travelling, no person is allowed inside the cabin.
- During service tool kit travelling, user shall constantly verify that travel zone is free of obstacles.
- During service tool kit travelling, user shall be attached to service anchor point at all times.
- During service tool kit travelling, user shall use both hands to actuate the two-hand control buttons.
- During service tool kit travelling, user shall not extend body parts beyond the service tool kit perimeter.
- During service tool kit travelling, no person is allowed at platforms located over it.



¹⁾ Optional for CE versions and for AECO version.

²⁾ Not available for CE versions. Mandatory for AECO version.

E.6 Information signs and documents

The following information signs and documents are supplied with the service tool kit and shall always be available.

Location	Document
Service tool kit	Standing on top only with service tool kit sticker
	Quick guide of service tool kit
	Electrical hazard warning sticker
	Evacuation guide of service tool kit
	Pull to release sticker ¹⁾



Standing on top only with service tool kit sticker



Electrical hazard warning sticker



Service tool kit quick guide



Evacuation guide of service tool kit

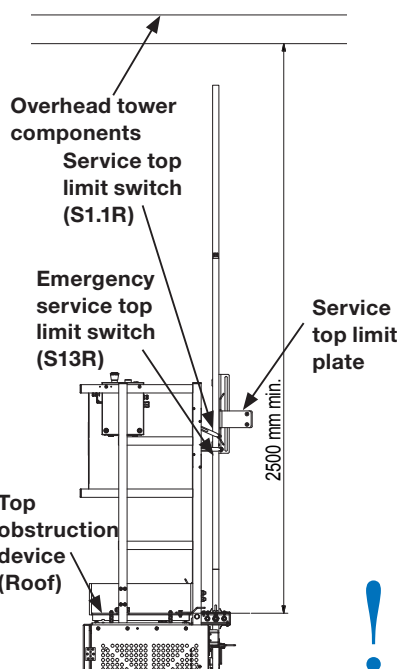
E.7 WTG integration requirements

Special attention shall be given to the integration of the service tool kit in the WTG.

WTG component	General integration requirements
Fences of intermediate and top platforms.	Top surfaces of horizontal railings shall feature non-slip treatment.

E.8 Service top limit plate

The service top limit switches override those ones on the cabin. They are activated by a service top limit plate, which shall be installed on the ladder so that top obstruction device (roof) is at least 2500 mm from overhead tower components when the service lift reaches its maximum top travel.

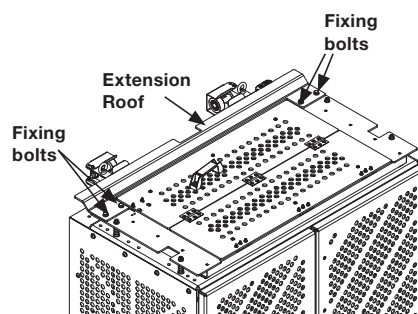


Service tool kit shall be mounted on lift at bottom platform.

E.9 Installation

The preassembled set can be entered through the tower door. The service tool kit is installed on the top of the cabin and fastened with bolts through lifting eyes.

1. Remove the extension roof.



2. Fix the lifting eyes on to the cabin.
 3. Position the preassembled structure over the service lift roof.
 4. Insert the bolts through the vertical profiles, the three lifting eyes and the reinforcement for installation.
 5. Tight the bolts with nuts.
 6. Connect service control box to the cabin control box.
 7. Turn the NORMAL/SERVICE selector of the cabin control box to SERVICE position.
- Disassembling is done in reverse order.



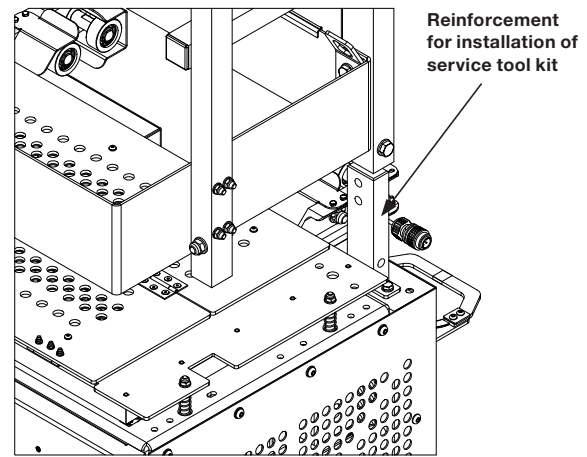
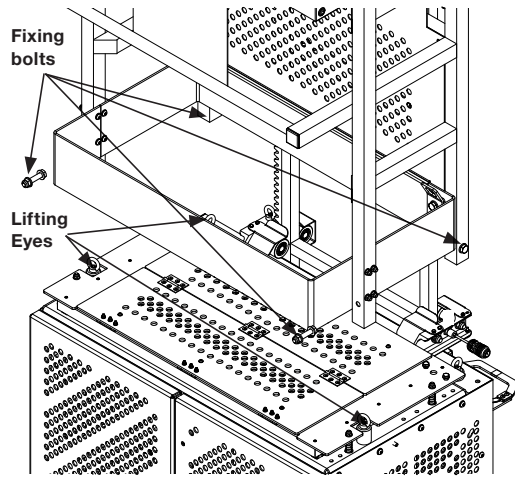
After the service tool kit has been disassembled from the service lift, perform an inspection filling in the "Appendix B: Inspection checklist" and the "Appendix C: Operation log sheet".



After the service tool kit has been disassembled from the service lift, remember to remove the lifting eyes and the reinforcement for installation and to install the extension roof!



¹⁾ Optional for CE versions. Mandatory for AECO version.



Disassembling is done in reverse order.



When standing on top of cabin, installer shall be attached to safety ladder by means of the fall arrest equipment.



Use a hand winch attachable to the ladder to safely elevate preassembled service tool kit over service lift.



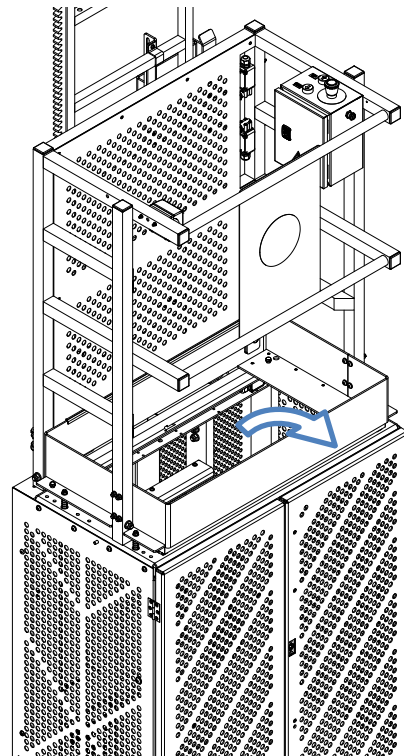
After installation of the service tool kit and before use, an inspection must be performed following the “E.15 Inspection checklist” and results shall be recorded in “Appendix C: Operation log sheet”.

E.10 Instructions for use at bottom platform

To access service tool kit from bottom platform:

1. Level service lift floor with platform floor.
2. Climb up the internal cabin ladder.
3. Open top hatch and climb through it, using the lateral non-slip railings of the service tool kit.
4. Close the top hatch.
5. Hook your fall arrest equipment to the service anchor point.
6. Press and hold the UP and OK buttons simultaneously (two-hand controls) to ascend.

Egress from service tool kit is done in reverse order.



E.11 Instructions for use at intermediate and top platforms

To egress to intermediate and top platforms from service tool kit:

1. Level service lift roof with platform floor.
2. Attach second fall arrest equipment to guiding ladder.
3. Release first fall arrest equipment from service anchor point.
3. Climb over service tool kit fence and overpass platform fence as specified by manufacturer.
4. Release fall arrest equipment from guiding ladder.

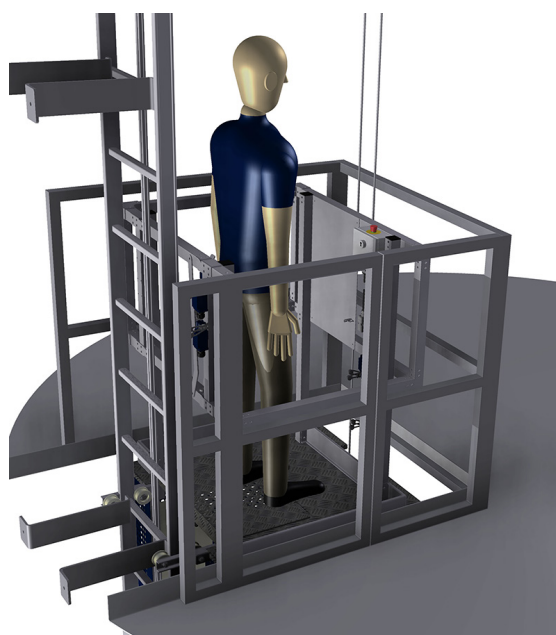
To access the service tool kit from intermediate and top platforms:

1. Attach fall arrest equipment to guiding ladder.
2. Overpass platform fence as specified by manufacturer and climb over service tool kit fence.
3. Attach second fall arrest equipment to the service anchor point.
4. Release fall arrest equipment from guiding ladder.

E.12 Safety measures

If lift is stopped between platforms with unconscious person on service tool kit:


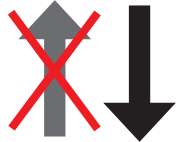
1. Climb up to the lift.
2. Check that victim has no body parts extending through service tool kit perimeter.
3. Enter the cabin through the bottom hatches.
4. Perform manual descent to the closest platform.
5. Use a hand winch attached to a ladder to elevate the victim over service tool kit and to place him on platform floor.



E.13 Maintenance planning

Frequency	Performed by	Components
Daily	Supervisor	Control and safety devices of service tool kit (only when mounted)
Annually	AVANTI, or qualified personnel authorised by AVANTI	Control and safety devices of service tool kit (only when mounted)

E.14 Troubleshooting

Breakdown	#	Cause	Solution
<p>The service tool kit cannot ascend nor descend.</p> 	A1	It overrides cabin control box.	Use service control box.
		Service emergency top limit switch (S13r) is activated.	Perform manual descent from inside the cabin until switch is released.
<p>Service tool kit can descend but cannot ascend.</p> 	B1	Service top limit switch (S1.1r) is activated.	Descend service tool kit until switch is released.

E.15 Inspection checklist

1 CONTROL & SAFETY DEVICES OF SERVICE TOOL KIT		OK	Not OK	ISSUE DESCRIPTION
1.1	Top limit plate is placed so that top obstruction device (roof) is at least 2500 mm from the overhead tower components when the service lift reaches its maximum top travel.			
1.2	The lifting eyes, the reinforcement for installation and the fixing bolts are properly mounted: so that service tool kit activates the top obstruction device (roof).			
1.3	Turn NORMAL/SERVICE selector of cabin control box to NORMAL position: controls of cabin control box do not function. And controls of service control box do not function.			
1.4	Turn NORMAL/SERVICE selector of cabin control box to SERVICE position: controls of cabin control box do not function. And controls of service control box function.			
1.5	Insert around 40 kg inside the cabin: controls of service control box do not function. Then, remove the 40 kg.			
1.6	Press and hold UP and second hand buttons simultaneously (two-hand controls): ascent is possible (2 m).			
1.7	While triggering service top limit switch (S1.1r), press and hold UP and second hand buttons simultaneously: ascent is not possible.			
1.8	While triggering service top limit switch (S1.1r), press and hold DOWN and second hand buttons simultaneously: descent is possible (1 m).			
1.9	Press and hold DOWN and second hand buttons simultaneously (two-hand controls): descent is possible (1 m).			
2.0	While triggering service emergency top limit switch (S13r), press and hold UP/DOWN and second hand buttons simultaneously: ascent/descent is not possible.			
2.1	Press emergency stop button of service control box, and press and hold UP/DOWN and second hand buttons simultaneously: ascent/descent is not possible.			
2.2	Pull to release emergency stop button, and press and hold UP/DOWN and second hand buttons simultaneously: ascent/descent is possible (0.5 m).			
2.3	All emergency stop buttons function properly.			
2.4	Bottom obstruction switches sit and function properly.			
2.5	Bottom cabin hatch switch sits and functions properly.			
2.6	Bottom obstruction hatch switch sits and functions properly.			
2.7	Top hatch switch sits and functions properly.			
2.8	(If provided) Bottom limit switch sits and functions properly.			
2.9	(If provided) Door switch sits and functions properly.			
2.10	(If provided) Door guard locking switch (S19.3) sits and functions properly.			
2.11	Service anchor point is free of damage and properly installed.			

